The Undergraduate Calendar

Except where otherwise indicated, the information in this Calendar applies to the 1991-92 academic year which commences in May, 1991.

The University of Waterloo publishes:
*An Undergraduate Admissions Handbook
*An Undergraduate Calendar
A Graduate Studies Calendar
A Correspondence Program Calendar
A Part-Time Studies Calendar

And booklets on the following:
*Faculty of Applied Health Sciences
*Faculty of Arts and the Colleges of Waterloo
*Faculty of Engineering
*Faculty of Environmental Studies
*Faculty of Mathematics
*Faculty of Science
*Independent Studies Program

*appear in the WATBOX

Course description information in the Undergraduate Calendar is accurate as to intention at the time of publication. However, actual course content and the hours/type of instruction may vary somewhat from the listings in the Calendar. Furthermore, circumstances may warrant changes to the term(s) when courses are made available. To be assured of complete information for preregistration, students must consult the University Course Offerings List and any other information distributed by their Department/Faculty, as well as the Calendar, before arranging their programs of study.

The University reserves the right to require a student to withdraw from a course or courses for academic or other reasons.

The Senate and Board of Governors of the University of Waterloo reserves the right to invoke changes in this Calendar without prior notice.

Students with Disabilities

The University has developed a number of services to assist students with disabilities. More information is on page 1:16 of this Calendar.

Inquiries

Inquiries and formal applications for admission should be directed to:

The Registrar
University of Waterloo
Waterloo, Ontario, Canada N2L 3G1
Telephone (519) 885-1211, ext. 2268

The Registrar's Office is located on the second floor of Ira G. Needle Hall. Office hours are from 8:30 a.m. to 4:30 p.m., Monday through Friday.

Federated and Affiliated Church Colleges:
Conrad Grebel College
Westmount Road North
Waterloo, Ontario N2L 3G6
(519) 885-0220

Renison College
Westmount Road North
Waterloo, Ontario N2L 3G4
(519) 884-4400

University of St. Jerome's College
Westmount Road North
Waterloo, Ontario N2L 3G3
(519) 884-8110

St. Paul's College
Westmount Road North
Waterloo, Ontario N2L 3G5
(519) 885-1460

Page Numbering System

Pages are numbered sequentially in the General Information section. In the subsequent chapters, the digits preceding the colon indicate the chapter number and the digits following the colon indicate the page number within the particular chapter.
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* These programs normally fulfill the academic requirements for registration in the related professions. See the Undergraduate Program section of this Calendar.
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Many disciplines are also available as Minors and Joint Honours programs.

* These programs normally fulfill the academic requirements for registration in the related professions. See the Undergraduate Program section of this Calendar.
## Programs Available

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<td>Philosophy</td>
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<tr>
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<td>Spanish</td>
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<td>Statistics</td>
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<tr>
<td>Statistics/Joint Honours</td>
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<tr>
<td>Systems Design Engineering</td>
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<td>10:31 :154</td>
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<tr>
<td>Women’s Studies Option or Diploma</td>
<td>•</td>
<td>•</td>
<td>•</td>
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<td>15:17 :158</td>
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</tr>
</tbody>
</table>

Many disciplines are also available as Minors and Joint Honours programs.

* These programs normally fulfill the academic requirements for registration in the related professions. See the Undergraduate Program section of this Calendar.
Glossary of Terms

Academic Program
A series of courses, a number of which may be mandatory and of a specialized nature, leading toward a particular degree. Details of the several types of programs offered such as Honours, General, Preprofessional, Professional are given in the Calendar.

Antirequisites
Courses with significant overlap. Degree credit cannot be obtained for both the antirequisite and the course(s) naming it as such.

Corequisite
A course required to be taken concurrently with, or passed prior to registration in, another course which lists it as a corequisite.

Prerequisite
A course required to be passed prior to registration in another course which lists it as a prerequisite. ("Consent of instructor" is sometimes listed as an alternative to or in addition to a prerequisite.)

Course
A unit of study relating to a specific academic discipline, and identified by a course name and number.

Credit
A unit of an academic program earned toward a degree by successful completion of a course. A credit weight of 0.5 is normally assigned to a one-term course. Credit weights are used in the calculation of averages for academic standing. Most courses have credit weights of 0.5, but some have weights such as 0.25, 1.0, 2.0. Further explanation is on page 18.

Cross-Listed Courses
Courses which are listed under two departments and which can be taken for credit from either department, but not both.

Cross-Registration
An arrangement between the University of Waterloo and Wilfrid Laurier University which enables students of either University to take courses at the other institution; the purpose is to provide access to courses which are not offered at a student's home institution.

Elective
A course not specifically required for a degree but counting towards it, to be chosen freely by the student either from within a specified group of courses or more broadly from courses offered anywhere across the University.

Letter of Permission
A document permitting a student to take specified courses at another university to be considered for credit toward a particular University of Waterloo degree.

Major
The area(s) of academic emphasis selected in either an Honours or a General program. Details of course and average requirements are given in academic program sections of the Calendar.

Minor
A group of approved courses taken by a student in an Honours or a four-year General program in a subject outside the "major" area. Details of course and average requirements are given in academic program sections of the Calendar.

Option
A specified combination or grouping of courses which provides a secondary emphasis in certain programs. The emphasis may be in another academic subject, as in Honours Chemistry (Environmental Studies Option), or in a career-oriented area, such as Honours Mathematics (Business Administration Option), or Honours French (Teaching Option).

Practicum
Supervised placement time in a work setting exercising practical routines and techniques related to a particular academic program or option.

Preregistration
The process of selecting courses prior to registration, having them approved by a faculty advisor and recorded with the Registrar's Office.

Registered Student
A student is considered to be registered if the student's selection of courses has been approved by a Faculty Advisor and the student has made the appropriate arrangements with the University to pay the required fees.

Term
A particular four-month period of academic registration:
Fall term – September to December; Winter term – January to April; Spring term – May to August. Also used with reference to work terms for students in the Co-operative system of study.

Full-Time Student
A student is considered a full-time student when his/her course load reaches or exceeds 1.50 credits in a four-month term. Full-time students are assessed applicable co-operative and incidental fees if their on-campus course load reaches or exceeds 1.50 credits in a four-month term.

Part-Time Student
A student is considered a part-time student when his/her course load is less than 1.50 credits in a four-month term.
# Academic Calendar – 1991

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
<th>Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meeting – Senate Executive Committee</td>
<td>March 4</td>
<td>Monday</td>
</tr>
<tr>
<td>Preregistration Begins – Undergraduate Programs – Fall Term</td>
<td>March 4</td>
<td>Monday</td>
</tr>
<tr>
<td>Preregistration Ends – Undergraduate Programs – Fall Term</td>
<td>March 8</td>
<td>Friday</td>
</tr>
<tr>
<td>Winter Employer Interviews End – Co-operative Programs</td>
<td>March 8</td>
<td>Friday</td>
</tr>
<tr>
<td>Campus Day</td>
<td>March 12</td>
<td>Tuesday</td>
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<tr>
<td>Meeting – University Senate, 7:30 p.m.</td>
<td>March 18</td>
<td>Monday</td>
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<tr>
<td>Meeting – Board of Governors Executive Committee</td>
<td>March 19</td>
<td>Tuesday</td>
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<tr>
<td>Good Friday – University Holiday*</td>
<td>March 29</td>
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<tr>
<td>Meeting – Senate Executive Committee</td>
<td>April 1</td>
<td>Monday</td>
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<tr>
<td>Meeting – Board of Governors, 3:30 p.m.</td>
<td>April 2</td>
<td>Tuesday</td>
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<tr>
<td>Lectures End – Winter Term</td>
<td>April 3</td>
<td>Wednesday</td>
</tr>
<tr>
<td>Examinations Begin – Winter Term</td>
<td>April 6</td>
<td>Saturday</td>
</tr>
<tr>
<td>Meeting – University Senate, 7:30 p.m.</td>
<td>April 15</td>
<td>Monday</td>
</tr>
<tr>
<td>Examinations End – Winter Term</td>
<td>April 20</td>
<td>Saturday</td>
</tr>
<tr>
<td>Final Examinations Results Due – Winter Term</td>
<td>April 26</td>
<td>Friday</td>
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<tr>
<td>Winter Work Term Ends – Co-operative Programs</td>
<td>April 26</td>
<td>Friday</td>
</tr>
<tr>
<td>Course Drop/Withdrawal Deadline – Correspondence – Winter Term</td>
<td>April 27</td>
<td>Saturday</td>
</tr>
<tr>
<td>Spring Work Term Begins – Co-operative Programs</td>
<td>April 29</td>
<td>Monday</td>
</tr>
<tr>
<td>Registration Begins – Undergraduate Programs – Spring Term</td>
<td>May 1</td>
<td>Wednesday</td>
</tr>
<tr>
<td>Registration – Graduate Studies – Spring Term</td>
<td>May 1</td>
<td>Wednesday</td>
</tr>
<tr>
<td>Lectures Begin – Spring Term</td>
<td>May 2</td>
<td>Thursday</td>
</tr>
<tr>
<td>Registration Ends – Undergraduate Programs – Spring Term</td>
<td>May 3</td>
<td>Friday</td>
</tr>
<tr>
<td>Examinations – Correspondence – Winter Term</td>
<td>May 4</td>
<td>Saturday</td>
</tr>
<tr>
<td>Meeting – Senate Executive Committee</td>
<td>May 6</td>
<td>Monday</td>
</tr>
<tr>
<td>Start of Late Fees – Spring Term</td>
<td>May 6</td>
<td>Monday</td>
</tr>
<tr>
<td>Victoria Day – University Holiday*</td>
<td>May 20</td>
<td>Monday</td>
</tr>
<tr>
<td>Meeting – University Senate, 7:30 p.m.</td>
<td>May 21</td>
<td>Tuesday</td>
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<tr>
<td>Meeting – Board of Governors Executive Committee</td>
<td>May 21</td>
<td>Tuesday</td>
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<tr>
<td>End of Course Change Period – Spring Term – See Individual Faculty Chapters</td>
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<tr>
<td>Spring Convocation (Applied Health Sciences, Environmental Studies, Independent Studies) – 2:00 p.m.</td>
<td>May 22</td>
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<tr>
<td>Spring Convocation (Arts) – 2:00 p.m.</td>
<td>May 23</td>
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<tr>
<td>Spring Convocation (Science) – 2:00 p.m.</td>
<td>May 24</td>
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<tr>
<td>Spring Convocation (Mathematics – 10:00 a.m.; Engineering – 2:00 p.m.)</td>
<td>May 25</td>
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<tr>
<td>Examination Results Due – Correspondence – Winter Term</td>
<td>May 31</td>
<td>Friday</td>
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<tr>
<td>Meeting – Senate Executive Committee</td>
<td>June 3</td>
<td>Monday</td>
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<tr>
<td>Application and Course Change Deadlines for New Students – Correspondence – Fall Term</td>
<td>June 3</td>
<td>Monday</td>
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<tr>
<td>Meeting – Board of Governors, 3:30 p.m.</td>
<td>June 4</td>
<td>Tuesday</td>
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<tr>
<td>Spring Employer Interviews Begin – Co-operative Programs</td>
<td>June 5</td>
<td>Wednesday</td>
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<tr>
<td>Preregistration Begins – Co-operative Programs – Winter Term</td>
<td>June 12</td>
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<tr>
<td>Preregistration Ends – Co-operative Programs – Winter Term</td>
<td>June 14</td>
<td>Friday</td>
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<tr>
<td>Meeting – University Senate, 7:30 p.m.</td>
<td>June 17</td>
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<td>Application and Course Change Deadlines for Returning Students – Correspondence – Fall Term</td>
<td>June 28</td>
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<tr>
<td>Spring Employer Interviews End – Co-operative Programs</td>
<td>June 28</td>
<td>Friday</td>
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<tr>
<td>Canada Day – University Holiday*</td>
<td>July 1</td>
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<td>Registration – Summer Session</td>
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<td>July 2</td>
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<td>Start of Late Fees – Summer Session</td>
<td>July 3</td>
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<td>Course Drop/Withdrawal Deadline – Correspondence – Spring Term</td>
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<td>Lectures End – Spring Term</td>
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<tr>
<td>Examinations Begin – Spring Term</td>
<td>July 30</td>
<td>Tuesday</td>
</tr>
</tbody>
</table>

* Some University Departments may be open for limited service on these days.
### Academic Calendar

**Civic Holiday – University Holiday**
- **August 5** Monday

**Lectures End – Summer Session**
- **August 9** Friday

**Examinations – Correspondence – Spring Term**
- **August 10** Saturday

**Examinations End – Spring Term**
- **August 10** Saturday

**Examinations – Summer Session**
- **August 10** Saturday

**Final Examination Results Due – Spring, Summer**
- **August 16** Friday

**Spring Work Term Ends – Co-operative Programs**
- **August 30** Friday

**Labour Day – University Holiday**
- **September 2** Monday

**Examination Results Due – Correspondence – Spring Term**
- **September 3** Tuesday

**Registration Begins – Undergraduate Programs – Fall Term**
- **September 8** Tuesday

**Meeting – Senate Executive Committee**
- **September 3** Tuesday

**Fall Work Term Begins – Co-operative Programs**
- **September 3** Tuesday

**Registration – Graduate Studies – Fall Term**
- **September 6** Friday

**Registration Ends – Undergraduate Programs – Fall Term**
- **September 6** Friday

**Lectures Begin – Fall Term**
- **September 9** Monday

**Start of Late Fees – Fall Term**
- **September 9** Monday

**Meeting – University Senate, 7:30 p.m.**
- **September 16** Monday

**Application and Course Change Deadlines for New Students – Correspondence – Winter Term**
- **September 16** Monday

**Meeting – Board of Governors Executive Committee**
- **September 17** Tuesday

**End of Course Change Period – Fall Term – See Individual Faculty Chapters**

**Meeting – Board of Governors, 3:30 p.m.**
- **October 1** Tuesday

**Meeting – Senate Executive Committee**
- **October 7** Monday

**Application and Course Change Deadlines for Returning Students – Correspondence – Winter Term**
- **October 11** Friday

**Thanksgiving Day – University Holiday**
- **October 14** Monday

**Fall Employer Interviews Begin – Co-operative Programs**
- **October 14** Monday

**Meeting – University Senate, 7:30 p.m.**
- **October 21** Monday

**Fall Convocation (Applied Health Sciences, Arts – 10:00 a.m.; Engineering, Environmental Studies, Independent Studies, Mathematics, Science – 2:00 p.m.)**
- **October 26** Saturday

**Meeting – Senate Executive Committee**
- **November 4** Monday

**Preregistration Begins – Co-operative Programs – Spring Term**
- **November 6** Wednesday

**Fall Employer Interviews End – Co-operative Programs**
- **November 8** Friday

**Preregistration Ends – Co-operative Programs – Spring Term**
- **November 8** Friday

**Meeting – University Senate, 7:30 p.m.**
- **November 18** Monday

**Meeting – Senate Executive Committee**
- **December 2** Monday

**Lectures End – Fall Term**
- **December 3** Tuesday

**Examinations Begin – Fall Term**
- **December 6** Friday

**Meeting – University Senate, 7:30 p.m.**
- **December 16** Monday

**Examinations End – Fall Term**
- **December 20** Friday

**Fall Work Term Ends – Co-operative Programs**
- **December 24** Tuesday

**Christmas Holidays**
- **December 25** Wednesday

**December 31** Tuesday

**Meeting – Senate Executive Committee**
- **December 31** Tuesday

**Winter Work Term Begins – Co-operative Programs**
- **December 30** Monday

*Some University Departments may be open for limited service on these days.*
## 1992

<table>
<thead>
<tr>
<th>Event</th>
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<tbody>
<tr>
<td>New Year's Day - University Holiday*</td>
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<td>Thursday</td>
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<tr>
<td>Final Examination Results Due - Fall Term</td>
<td>January 3</td>
<td>Friday</td>
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<tr>
<td>Registration Begins - Undergraduate Programs - Winter Term</td>
<td>January 6</td>
<td>Monday</td>
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<tr>
<td>Registration - Graduate Studies - Winter Term</td>
<td>January 6</td>
<td>Monday</td>
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<tr>
<td>Lectures Begin - Winter Term</td>
<td>January 6</td>
<td>Monday</td>
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<tr>
<td>Meeting - Senate Executive Committee</td>
<td>January 6</td>
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<tr>
<td>Registration Ends - Undergraduate Programs - Winter Term</td>
<td>January 7</td>
<td>Tuesday</td>
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<tr>
<td>Start of Late Fees - Winter Term</td>
<td>January 8</td>
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<tr>
<td>Examinations - Correspondence - Fall Term</td>
<td>January 18</td>
<td>Saturday</td>
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<tr>
<td>Meeting - University Senate, 7:30 p.m.</td>
<td>January 20</td>
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<tr>
<td>Meeting - Board of Governors Executive Committee</td>
<td>January 21</td>
<td>Tuesday</td>
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<td>Application and Course Change Deadlines for New Students -</td>
<td>January 27</td>
<td>Monday</td>
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<tr>
<td>Correspondence - Spring Term</td>
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<td>End of Course Change Period - Winter Term - See Individual Faculty Chapters</td>
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<td>Meeting - Senate Executive Committee</td>
<td>February 3</td>
<td>Monday</td>
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<tr>
<td>Meeting - Board of Governors, 3:30 p.m.</td>
<td>February 4</td>
<td>Tuesday</td>
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<tr>
<td>Winter Employer Interviews Begin - Co-operative Programs</td>
<td>February 5</td>
<td>Wednesday</td>
</tr>
<tr>
<td>Application and Course Change Deadlines for Returning Students - Correspondence - Spring Term</td>
<td>February 14</td>
<td>Friday</td>
</tr>
<tr>
<td>Examination Results Due - Correspondence - Fall Term</td>
<td>February 14</td>
<td>Friday</td>
</tr>
<tr>
<td>Meeting - University Senate, 7:30 p.m.</td>
<td>February 17</td>
<td>Monday</td>
</tr>
<tr>
<td>Study Break - Engineering †</td>
<td>February 17, 18</td>
<td>Monday, Tuesday</td>
</tr>
<tr>
<td>Study Week Begins - Other Faculties †</td>
<td>February 17</td>
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<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
<th>Day</th>
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<tbody>
<tr>
<td>Meeting - Senate Executive Committee</td>
<td>March 2</td>
<td>Monday</td>
</tr>
<tr>
<td>Preregistration Begins - Undergraduate Programs - Fall Term</td>
<td>March 2</td>
<td>Monday</td>
</tr>
<tr>
<td>Winter Employer Interviews End - Co-operative Programs</td>
<td>March 6</td>
<td>Friday</td>
</tr>
<tr>
<td>Preregistration Ends - Undergraduate Programs - Fall Term</td>
<td>March 6</td>
<td>Friday</td>
</tr>
<tr>
<td>Meeting - University Senate, 7:30 p.m.</td>
<td>March 16</td>
<td>Monday</td>
</tr>
<tr>
<td>Campus Day</td>
<td>March 17</td>
<td>Tuesday</td>
</tr>
<tr>
<td>Meeting - Board of Governors Executive Committee</td>
<td>March 24</td>
<td>Tuesday</td>
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<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
<th>Day</th>
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</thead>
<tbody>
<tr>
<td>Lectures End - Winter Term</td>
<td>April 3</td>
<td>Friday</td>
</tr>
<tr>
<td>Meeting - Senate Executive Committee</td>
<td>April 6</td>
<td>Monday</td>
</tr>
<tr>
<td>Meeting - Board of Governors, 3:30 p.m.</td>
<td>April 7</td>
<td>Tuesday</td>
</tr>
<tr>
<td>Examinations Begin - Winter Term</td>
<td>April 7</td>
<td>Tuesday</td>
</tr>
<tr>
<td>Course Drop/Withdrawal Deadline - Correspondence - Winter Term</td>
<td>April 15</td>
<td>Wednesday</td>
</tr>
<tr>
<td>Good Friday - University Holiday*</td>
<td>April 17</td>
<td>Friday</td>
</tr>
<tr>
<td>Meeting - University Senate, 7:30 p.m.</td>
<td>April 20</td>
<td>Monday</td>
</tr>
<tr>
<td>Examinations End - Winter Term</td>
<td>April 22</td>
<td>Wednesday</td>
</tr>
<tr>
<td>Winter Work Term Ends - Co-operative Programs</td>
<td>April 24</td>
<td>Friday</td>
</tr>
<tr>
<td>Spring Work Term Begins - Co-operative Programs</td>
<td>April 27</td>
<td>Monday</td>
</tr>
<tr>
<td>Final Examinations Results Due - Winter Term</td>
<td>April 29</td>
<td>Wednesday</td>
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<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
<th>Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examinations - Correspondence - Winter Term</td>
<td>May 2</td>
<td>Saturday</td>
</tr>
<tr>
<td>Registration Begins - Undergraduate Programs - Spring Term</td>
<td>May 4</td>
<td>Monday</td>
</tr>
<tr>
<td>Registration - Graduate Studies - Spring Term</td>
<td>May 4</td>
<td>Monday</td>
</tr>
<tr>
<td>Lectures Begin - Spring Term</td>
<td>May 4</td>
<td>Monday</td>
</tr>
<tr>
<td>Meeting - Senate Executive Committee</td>
<td>May 4</td>
<td>Monday</td>
</tr>
<tr>
<td>Registration Ends - Undergraduate Programs - Spring Term</td>
<td>May 5</td>
<td>Tuesday</td>
</tr>
<tr>
<td>Start of Late Fees - Spring Term</td>
<td>May 6</td>
<td>Wednesday</td>
</tr>
<tr>
<td>Victoria Day - University Holiday*</td>
<td>May 18</td>
<td>Monday</td>
</tr>
<tr>
<td>Meeting - University Senate, 7:30 p.m.</td>
<td>May 19</td>
<td>Tuesday</td>
</tr>
<tr>
<td>Meeting - Board of Governors Executive Committee</td>
<td>May 19</td>
<td>Tuesday</td>
</tr>
</tbody>
</table>

* Some University Departments may be open for limited service on these days.
† Co-operative employment interviews will continue as scheduled in this period.
## Academic Calendar

### 1992 Continued

<table>
<thead>
<tr>
<th>Event Description</th>
<th>Date</th>
<th>Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>End of Course Change Period – Spring Term – See Individual Faculty Chapters</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spring Convocation (Applied Health Sciences, Environmental Studies, Independent Studies) – 2:00 p.m.</td>
<td>May 27</td>
<td>Wednesday</td>
</tr>
<tr>
<td>Spring Convocation (Arts) – 2:00 p.m.</td>
<td>May 28</td>
<td>Thursday</td>
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<tr>
<td>Spring Convocation (Science) – 2:00 p.m.</td>
<td>May 29</td>
<td>Friday</td>
</tr>
<tr>
<td>Spring Convocation (Mathematics – 10:00 a.m.; Engineering – 2:00 p.m.)</td>
<td>May 30</td>
<td>Saturday</td>
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<tr>
<td>Examination Results Due – Correspondence – Winter Term</td>
<td>May 29</td>
<td>Friday</td>
</tr>
<tr>
<td>Meeting – Senate Executive Committee</td>
<td>June 1</td>
<td>Monday</td>
</tr>
<tr>
<td>Meeting – Board of Governors, 3:30 p.m.</td>
<td>June 2</td>
<td>Tuesday</td>
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<tr>
<td>Spring Employer Interviews Begin – Co-operative Programs</td>
<td>June 3</td>
<td>Wednesday</td>
</tr>
<tr>
<td>Preregistration Begins – Co-operative Programs – Winter Term</td>
<td>June 10</td>
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</tr>
<tr>
<td>Preregistration Ends – Co-operative Programs – Winter Term</td>
<td>June 12</td>
<td>Friday</td>
</tr>
<tr>
<td>Meeting – University Senate, 7:30 p.m.</td>
<td>June 15</td>
<td>Monday</td>
</tr>
<tr>
<td>Spring Employer Interviews End – Co-operative Programs</td>
<td>June 26</td>
<td>Friday</td>
</tr>
<tr>
<td>Canada Day – University Holiday*</td>
<td>July 1</td>
<td>Wednesday</td>
</tr>
<tr>
<td>Registration – Summer Session</td>
<td>July 6</td>
<td>Monday</td>
</tr>
<tr>
<td>Registration – Graduate Studies – Summer Session</td>
<td>July 6</td>
<td>Monday</td>
</tr>
<tr>
<td>Lectures Begin – Summer Session</td>
<td>July 6</td>
<td>Monday</td>
</tr>
<tr>
<td>Start of Late Fees – Summer Session</td>
<td>July 7</td>
<td>Tuesday</td>
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<tr>
<td>Course Drop/Withdrawal Deadline – Correspondence – Spring Term</td>
<td>July 22</td>
<td>Wednesday</td>
</tr>
<tr>
<td>Lectures End – Spring Term</td>
<td>July 31</td>
<td>Friday</td>
</tr>
<tr>
<td>Civic Holiday – University Holiday*</td>
<td>August 3</td>
<td>Monday</td>
</tr>
<tr>
<td>Examinations Begin – Spring Term</td>
<td>August 4</td>
<td>Tuesday</td>
</tr>
<tr>
<td>Examinations – Correspondence – Spring Term</td>
<td>August 8</td>
<td>Saturday</td>
</tr>
<tr>
<td>Lectures End – Summer Session</td>
<td>August 14</td>
<td>Friday</td>
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<td>Examinations End – Spring Term</td>
<td>August 15</td>
<td>Saturday</td>
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<tr>
<td>Examinations – Summer Session</td>
<td>August 15</td>
<td>Saturday</td>
</tr>
<tr>
<td>Final Examination Results Due – Spring; Summer</td>
<td>August 21</td>
<td>Friday</td>
</tr>
<tr>
<td>Spring Work Term Ends – Co-operative Programs</td>
<td>August 28</td>
<td>Friday</td>
</tr>
<tr>
<td>Fall Work Term Begins – Co-operative Programs</td>
<td>August 31</td>
<td>Monday</td>
</tr>
<tr>
<td>Examination Results Due – Correspondence – Spring Term</td>
<td>September 8</td>
<td>Tuesday</td>
</tr>
<tr>
<td>Registration – Graduate Studies – Fall Term</td>
<td>September 11</td>
<td>Friday</td>
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*Some University Departments may be open for limited service on these days.*
<table>
<thead>
<tr>
<th>1991</th>
<th>1 2 3 4 5</th>
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<td>13 14 15 16 17 18 19</td>
<td>20 21 22 23 24 25 26</td>
<td>27 28 29 30 31</td>
</tr>
<tr>
<td><strong>April</strong></td>
<td>1 2 3 4 5 6</td>
<td>7 8 9 10 11 12 13</td>
<td>14 15 16 17 18 19 20</td>
<td>21 22 23 24 25 26 27</td>
<td>28 29 30</td>
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<td><strong>July</strong></td>
<td>1 2 3 4 5 6</td>
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<td>14 15 16 17 18 19 20</td>
<td>21 22 23 24 25 26 27</td>
<td>28 29 30 31</td>
</tr>
<tr>
<td><strong>October</strong></td>
<td>1 2 3 4 5</td>
<td>6 7 8 9 10 11 12</td>
<td>13 14 15 16 17 18 19</td>
<td>20 21 22 23 24 25 26</td>
<td>27 28 29 30 31</td>
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<table>
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<tr>
<td><strong>January</strong></td>
<td>1 2 3 4 5</td>
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<td>13 14 15 16 17 18 19</td>
<td>20 21 22 23 24 25 26</td>
<td>27 28 29 30 31</td>
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<td><strong>April</strong></td>
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<td>14 15 16 17 18 19 20</td>
<td>21 22 23 24 25 26 27</td>
<td>28 29 30</td>
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<tr>
<td><strong>July</strong></td>
<td>1 2 3 4 5 6</td>
<td>7 8 9 10 11 12 13</td>
<td>14 15 16 17 18 19 20</td>
<td>21 22 23 24 25 26 27</td>
<td>28 29 30 31</td>
</tr>
<tr>
<td><strong>October</strong></td>
<td>1 2 3 4 5</td>
<td>6 7 8 9 10 11 12</td>
<td>13 14 15 16 17 18 19</td>
<td>20 21 22 23 24 25 26</td>
<td>27 28 29 30 31</td>
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<table>
<thead>
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<th>1993</th>
<th>1 2 3 4 5 6 7 8 9</th>
<th>10 11 12 13 14 15 16</th>
<th>17 18 19 20 21 22 23</th>
<th>24 25 26 27 28 29 30</th>
<th>31</th>
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</thead>
<tbody>
<tr>
<td><strong>January</strong></td>
<td>1 2 3 4 5 6 7 8 9</td>
<td>10 11 12 13 14 15 16</td>
<td>17 18 19 20 21 22 23</td>
<td>24 25 26 27 28 29 30</td>
<td>31</td>
</tr>
<tr>
<td><strong>April</strong></td>
<td>1 2 3 4 5 6</td>
<td>7 8 9 10 11 12 13</td>
<td>14 15 16 17 18 19 20</td>
<td>21 22 23 24 25 26 27</td>
<td>28</td>
</tr>
<tr>
<td><strong>July</strong></td>
<td>1 2 3 4 5 6 7 8 9</td>
<td>10 11 12 13 14 15 16</td>
<td>17 18 19 20 21 22 23</td>
<td>24 25 26 27 28 29 30</td>
<td>31</td>
</tr>
<tr>
<td><strong>October</strong></td>
<td>1 2 3 4 5 6 7 8 9</td>
<td>10 11 12 13 14 15 16</td>
<td>17 18 19 20 21 22 23</td>
<td>24 25 26 27 28 29 30</td>
<td>31</td>
</tr>
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</table>

| **March** | 1 2 3 4 5 6 7 8 9 | 10 11 12 13 14 15 16 | 17 18 19 20 21 22 23 | 24 25 26 27 28 29 30 | 31 |
| **June** | 1 2 3 4 5 6 7 8 9 | 10 11 12 13 14 15 16 | 17 18 19 20 21 22 23 | 24 25 26 27 28 29 30 | 31 |
| **September** | 1 2 3 4 5 6 7 8 9 | 10 11 12 13 14 15 16 | 17 18 19 20 21 22 23 | 24 25 26 27 28 29 30 | 31 |
| **December** | 1 2 3 4 5 6 7 8 9 | 10 11 12 13 14 15 16 | 17 18 19 20 21 22 23 | 24 25 26 27 28 29 30 | 31 |
There are two routes to the UW Campus from Hwy 401. The first route is to take exit 278 to Hwy 7 West to Kitchener, enter the Conestoga Pkwy, by following Hwy 7 East signs; then follow the Pkwy and exit at University Ave. West, drive in a westerly direction on University Ave. to University of Waterloo. The second route follows the first route to the Conestoga Pkwy, enter the Pkwy, following Hwy 7 & 8 West Stratford; continue on the Pkwy and exit at Fischer-Hallman Rd. Turn left at the Fischer-Hallman Rd. traffic lights and continue north west until you reach University Ave. Turn right on to University Ave. and drive easterly until you reach the University of Waterloo.
South Campus Hall (foreground) and the Dana Porter Library (background) as viewed from the University Avenue entrance of UW.
The Undergraduate Calendar

The Undergraduate Calendar is published once a year by the Office of the Registrar, University of Waterloo. The Calendar serves to provide a list of academic courses and programs, policies, and regulations regarding admissions, examinations, and fees, as well as general information about the University. For registration purposes, more complete information is provided in Course Offering Lists and Timetables which are published for each academic term.

If there is any doubt as to the interpretation of the contents of the Calendar, enquiries can be directed to the Registrar.

The Calendar is arranged in chapters which fall into five divisions. The first division describes the various services offered at the University. The second division outlines the undergraduate programs, and the third division describes the courses offered in these programs. The fourth division of the Calendar lists the University faculty and the last division lists the membership of the governing bodies of the University and the officers of the various administrative units.

Except where otherwise indicated, this Calendar applies to the 1991-1992 academic year, which commences in May, 1991. More specific information on effective dates for tuition and other fees, admission requirements, and course and program offerings may be found in the relevant chapters.

The University

Classes at the University of Waterloo commenced in July, 1957, with the introduction of the Co-operative Engineering Program. In March, 1959, a Private Bill was approved by the Legislative Assembly of the Province of Ontario incorporating the University of Waterloo as a degree-granting institution offering courses at both the undergraduate and the graduate level. The University is co-educational and non-denominational. Programs are offered in Applied Health Sciences, Arts, Engineering, Environmental Studies, Independent Studies, Mathematics, and Science. The University is a member of the Association of Universities and Colleges of Canada and the Association of Commonwealth Universities.

The Campus

The University is situated on a beautiful 900 acre campus in the northwest section of the City of Waterloo. Waterloo and its twin city Kitchener are steadily growing industrial centres in mid-western Ontario with a combined population of approximately 225,000.

Since the opening of the first permanent structure on campus in 1958, the University has expanded steadily. More than 40 teaching and service buildings presently on campus include a Computing Centre, a Physical Activities Building, an ice arena, extensive library facilities, two theatres, and a variety of modern residential accommodation in University and Church College residences.

University Colours

The official colours of the University of Waterloo are gold, black, and white.

University Arms and Motto

The Arms and Motto for the University of Waterloo, as first adopted in October 1961, and as officially granted in August 1987, by the Lord Lyon King of Arms, are described as follows:

Or, on a chevron Sable between three lions rampant Gules a Chevron Argent. Above the Shield is placed an Helm suitable to an Incorporation (VIDELICET: - a Salade Proper lined Gules) with a Mantling Sable doubled Or, and on a Wreath of the Liveries is set for Crest between two maple branches in saltire a trillium displayed and leaved all Proper, and in an Escrol over the same this Motto “CONCORDIA CUM VERITATE” - In Harmony with Truth.

The University Mace

The symbolic theme may be described as follows:

The fundamental concept is unity amid diversity and tension in the creative intellectual process that strives to bring forth a new individual.

The design of the mace interprets this theme in the idiom of the life process: from the seeds at the base of the stave the mace grows in unity and strength until it differentiates by a four-fold separation into diverse elements.

The four-fold diversity is significant because of the four faculties existing at the time the Mace was presented to the University and as well, of the four church-related colleges federated and affiliated with the University. These diverse elements together form a crown, and the points of the crown, while tending toward a union do not quite touch but remain as individuals suspended in tension and yet engaged in a deep harmony. This creative process is focused not on the traditional spherical orb of static perfection but rather on an elliptical silver ovum - the egg-shaped symbol of creativity - the marvellous potential of a new individual life.

University Academic Regalia

The academic regalia chosen for the University of Waterloo is patterned after that of the University of Oxford (except where noted).

Degree Hoods

1. For the Bachelor’s degree, hoods are black silk in the Oxford Bachelor shape, with a border in a colour which indicates the faculty or degree. Degree colours or colours of a specific discipline are:
   - Bachelor of Applied Science (BASc) - scarlet (Engineering)
   - Bachelor of Architecture (BArch) - yellow
   - Bachelor of Arts (BA) - green (Applied Health Sciences, Arts)
Bachelor of Environmental Studies (BES) – orange
(B) Bachelor of Independent Studies (BIS) – white
Bachelor of Mathematics (BMath) – wine
(Mathematics)
Bachelor of Science (BSc) – blue (Applied Health
Sciences, Science)
Doctor of Optometry (OD) – blue silk hood in the
American style, seafoam green border and gold
lining

2. For the Master’s degree, hoods are black silk in the
Oxford Master shape, lined with the appropriate degree
colour and turned over ¾”, trimmed with two rows of
white soutache braid (except where noted), ¾” from the
coloured edge.

Master of Accounting (MAcc) – lining and narrow
border in green with gold soutache braid trim
Master of Applied Environmental Studies (MAES) –
orange (Environmental Studies – Industrial
Development)
Master of Applied Science (MASc) – scarlet (Arts –
Applied Psychology, Engineering)
Master of Arts (MA) – green (Applied Health Sciences,
Arts, Environmental Studies – Geography, Planning
and Resource Development)
Master of Mathematics (MMath) – wine (Mathematics)
Master of Science (MSc) – blue (Applied Health
Sciences, Science).

3. The Master of Philosophy (MPhil) hood has a white silk
lining, banded ¾” inside and outside edges in green
silk, trimmed with white soutache braid.

4. The Doctor of Philosophy (PhD) hood has a green
shell with off-white taffeta lining patterned after the
University of Cambridge hood. The Doctoral hat is
black velvet in the Oxford style with gold cord trim and
tassel.

5. Honorary Degrees
Doctor of Divinity (DD) – purple silk with mauve lining
Doctor of Engineering (DEng) – scarlet silk with pink
lining
Doctor of Environmental Studies (DES) – orange silk
with ivory lining
Doctor of Laws (LLD) – pink silk with magenta lining
Doctor of Letters (DLet) – green silk with green silk
lining
Doctor of Mathematics (DMath) – wine silk with buff silk
lining
Doctor of Science (DSc) – blue silk with blue silk lining

Gowns
1. Bachelor and Master degree gowns are black with the
Oxford cut and trim.
2. Doctor of Philosophy degree gowns are of the Oxford
cut and trim and are red, with facings and lower third of
sleeves green.

3. Honorary degree gowns are of the Oxford cut and trim,
each with its own distinctive colour (following the
configuration of the honorary degree colours above).
The facings and lower third of the sleeves are black.

University Jurisdiction
The University exercises its statutory jurisdiction and
authority with respect to the operation, protection and
control of its property and plant and the regulation of
persons on campus insofar as is necessary to ensure the
orderly performance of the University’s functions.
In addition it should be recognized that all members of
the University, as members of society at large, are subject
to the general public, civil and criminal jurisdictions
whether on or off campus.

Academic Organization
The University is organized under several academic units
called Faculties as follows: The Faculty of Applied Health
Sciences, The Faculty of Arts, The Faculty of Engineering,
The Faculty of Environmental Studies, The Faculty of
Mathematics, and The Faculty of Science. Within this
framework are various departments and schools. Students
who want to follow a more independent and unstructured
course of study than the traditional one may wish to seek
admission to the Independent Studies Program.

Enrolment for each Faculty including church colleges
and off-campus students as of November 1, 1990:

<table>
<thead>
<tr>
<th>Faculty/Program</th>
<th>Full Time</th>
<th>Part Time</th>
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</thead>
<tbody>
<tr>
<td>Faculty of Applied Health Sciences</td>
<td>1304</td>
<td>322</td>
</tr>
<tr>
<td>Faculty of Arts</td>
<td>4159</td>
<td>5729</td>
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<tr>
<td>Faculty of Engineering</td>
<td>3009</td>
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<tr>
<td>Faculty of Environmental Studies</td>
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<td>441</td>
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<tr>
<td>Independent Studies Program</td>
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<td>2</td>
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<tr>
<td>Faculty of Mathematics</td>
<td>3309</td>
<td>361</td>
</tr>
<tr>
<td>Faculty of Science</td>
<td>2297</td>
<td>1278</td>
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<tr>
<td>Total Undergraduate Enrolment</td>
<td>15608</td>
<td>8441</td>
</tr>
<tr>
<td>Graduate Student Enrolment</td>
<td>1652</td>
<td>420</td>
</tr>
</tbody>
</table>

The Church Colleges
There are four church-related colleges associated with the
University.

University of St. Jerome’s College
In 1865, two years before Canada achieved nationhood,
St. Jerome’s College was founded by the Congregation of
the Resurrection to meet the demand for higher education
in Waterloo County.
Over the years the College grew in size and occupied
various locations in the Kitchener-Waterloo area. In 1959,
through an Act of the Ontario Legislature, St. Jerome’s
College was granted independent university status. The
name was changed to the University of St. Jerome’s
College to reflect new university powers and the authority
to grant degrees.
A short time later, the University of St. Jerome's College entered into federation with the young and growing University of Waterloo. In the federation agreement, the College waived its degree-granting rights so that now, students of St. Jerome's earn Bachelor of Arts or Bachelor of Mathematics degrees of the University of Waterloo.

Today, St. Jerome's College adds to the breadth of the University of Waterloo the institutional presence of a Catholic milieu in which Christian sources provide added matter for study and investigation. With over 1,000 full- and part-time students, a men's and women's residence accommodating 260 students, a faculty and staff of over 50 men and women, St. Jerome's College is a dynamic community.

The College teaches courses in English, History, Religious Studies, Psychology, French, Italian, Mathematics, Sociology and Philosophy and offers three special Summer programs in Learning Disabilities, Sexuality, Marriage and the Family and Theological Renewal.

From its local roots in Waterloo County, St. Jerome's has grown and today serves a much wider constituency. The College teaches undergraduate students from high schools throughout the province of Ontario and beyond. Educators, health care professionals, pastoral care workers and others take advantage of our special programs for professional upgrading and development.

The College brings its campus to the community in many ways, most notably through lectures and mini-courses sponsored by the St. Jerome's Centre for Catholic Experience and through the quarterly publication Grail: An Ecumenical Journal. Both Grail and the Centre heighten public awareness and understanding of the major social and religious issues of the day.

Renison College

Renison is the Anglican college on the University of Waterloo campus. Affiliated with the University, it registers students in programs of the Faculty of Arts, including its own Social Development Studies program. Renison also offers two Certificate programs; one in General Social Work and the other focusing on Child Abuse issues.

The College offers courses in Social Work, Psychology, Sociology and Interdisciplinary Social Science for its Social Development Studies program. This Interdisciplinary Major is designed for students interested in such helping professions as social work, teaching, theology and law. Students who complete the requirements receive the BA of the University. The program may be supplemented with the Diploma in Social Work to give students some supervised practical experience in local social service agencies.

In addition to those for Social Development Studies, the College offers courses in East Asian Culture, Chinese, English, Fine Arts, Japanese and Religious Studies. Renison College faculty members and courses are indicated by an "R" in this Calendar.

Renison residences accommodate 74 men and 91 women. Its students enjoy the sense of community and support that a small college can provide as well as all of the advantages of a major university.

Conrad Grebel College

Conrad Grebel College is a Mennonite church sponsored school providing residential, teaching, research and community education programs from a Christian perspective. The residence accommodates 113 students in an intimate atmosphere which emphasizes interpersonal relationships and community responsibility. College-sponsored extra-curricular programs in music, sports and the chapel are designed to complement the academic lives of students. The chapel program is central to the religious life of the College. Students from all backgrounds and world-views are welcome, subject to their willingness to abide by the College's values. An Associate Student program allows University of Waterloo students to engage in the life of the College community while living outside the College residence. Application forms for both the residence and associate programs are available from the College.

Academically the College offers courses in Interdisciplinary Arts, History, Philosophy, Religious Studies, Sociology, Peace and Conflict Studies and Music. The Peace and Conflict Studies and Music programs are administered by the College. All courses and programs are fully integrated into the University curriculum and are available to all students of the University. Students register for Conrad Grebel College courses through the University or through Ronicon or St. Jerome's College.

St. Paul's United College

St. Paul's United College is a teaching and residential community of 150 men and women.

The College is the site for two UW Interdisciplinary Options — see Chapter 15 for details. The Canadian Studies Option allows students to gain expertise in the social, cultural, economic, geographic, and political aspects of Canadian life. Studies in Personality and Religion enables students to understand the relationship between religious growth and experience as they relate to the dynamics of personality development.

The College also sponsors the University's Department of Religious Studies with the other colleges on the campus and the Faculty of Arts. Religious Studies courses are available for academic credit to any student enrolled in the University.

St. Paul's seeks to integrate its academic life with life in the residence. One section of the residence is designated "The French Residence", and offers English-speaking students who have achieved some competence in French an opportunity to further develop their skills. This program is offered in co-operation with the French Department.

Resident life in the College provides a valuable contribution to a student's university experience. Through an array of athletics, community dinners, and interest groups, students are able to involve themselves with various projects and issues related to the University, the church, personal life and society. Residents and Associates of St. Paul's participate in a vital and enriching community.
Degrees Offered

The University of Waterloo offers the following undergraduate degrees:

- Bachelor of Applied Science (BASc)
- Bachelor of Architecture (BArch)
- Bachelor of Arts (BA)
- Bachelor of Environmental Studies (BES)
- Bachelor of Independent Studies (BIS)
- Bachelor of Mathematics (BMath)
- Bachelor of Science (BSc)
- Doctor of Optometry (OD)

Further information concerning these degrees and their related programs is available in the Faculty sections of this Calendar.

The University of Waterloo offers the following graduate degrees:

- Master of Accounting (MAcc)
- Master of Applied Environmental Studies (MAES)
- Master of Applied Science (MASc)
- Master of Arts (MA)
- Master of Mathematics (MMath)
- Master of Science (MSc)
- Master of Philosophy (MPhil)
- Doctor of Philosophy (PhD)

Further information concerning these degrees and their related programs is available in the Graduate Calendar.

Honorary Degrees

The following honorary degrees are conferred by the Senate of the University:

- Doctor of Divinity (DD)
- Doctor of Engineering (DEng)
- Doctor of Environmental Studies (DES)
- Doctor of Laws (LLD)
- Doctor of Letters (DLitt)
- Doctor of Mathematics (DMath)
- Doctor of Science (DSc)

Convocation/Application for Degree

All undergraduate students who expect to receive degrees or diplomas at either the Spring or Fall Convocations must complete an "Intention to Graduate" form obtainable from the Registrar's Office or faculty offices. The deadlines for these forms are March 1 for Spring Convocation and August 1 for Fall Convocation. Students who apply for their degree at a specific convocation but do not quality must subsequently submit another "Intention to Graduate" form.

It should be noted that the name printed on the degree diploma will be that which is indicated on the "Intention to Graduate" form. Graduands who are unable to attend convocation will have their diplomas mailed to them by the Registrar's Office.

Systems of Study

The University offers students two different systems of study, the Regular System and the Co-operative System. Some programs are offered under one system only, while others are offered under either system. Each of the program sections in this Calendar contains information concerning the System of Study that can be followed for the program described.

Regular System

Under the Regular System of Study the student follows the conventional eight-month academic year from September to April.

Co-operative System

Students studying under the Co-operative System alternate academic term on campus with work terms off campus in business, industry, or government. Further information about the Co-operative System is provided in Chapter 5.

Part-Time Studies, Correspondence Courses, and Continuing Education

The Teaching Resource and Continuing Education (TRACE) Office is responsible for major policy development and co-ordination of activities related to correspondence courses, continuing education and to part-time studies in general.

Credit courses are available on-campus in the late afternoon and evenings to accommodate students who work during the day. Courses are also offered at off-campus locations in various communities. For those who live too far away or who have commitments which make attending classes at set times difficult, the University has an extensive Correspondence Program. There are also non-credit continuing education courses offered on campus at various times during the year.

No academic distinction is made between part-time and full-time students in admission standards, grading practices or promotion policies. The great majority of part-time students are adults and many are considered for admission under UW's Mature Student Admission Policy (for more information refer to "Admission – Other Applicants" page 2). Tuition fees are assessed on a per course basis.

Information on all part-time study opportunities and assistance with registration can be obtained from one central office:

Part-Time Studies
University of Waterloo
156 Columbia Street
Waterloo, Ontario N2L 3G1
Telephone: (519) 888-4002
Fax: (519) 746-6393
Regular business hours are from 8:30 a.m. to 4:30 p.m.
During the first week of classes each term the office remains open until 7:00 p.m. in order to assist on campus students with registration.

Part-Time Studies on Campus
Part-time students often enroll in classes scheduled in the evening or in late afternoon. However, part-time students are welcome to enroll in daytime classes as well. Students may earn most degrees entirely through part-time studies or by a combination of part-time and full-time attendance. For some programs in Applied Health Sciences, Mathematics, and Science, required courses are available only during the day. Students may pursue their studies in the Fall, Winter, or Spring terms or during the Summer sessions.

The Part-Time Studies Calendar, published annually, lists all courses offered in the late afternoon and evening and provides complete details of admission requirements, registration procedures, and general services for part-time students.

Part-Time Studies off Campus
Several University of Waterloo credit courses are offered each year in centres such as Kitchener and Waterloo, Cambridge, and other communities. Most of these courses meet one evening a week for three hours in the Fall, Winter, or Spring terms. Students earning credit in these courses may apply toward a degree along with credits earned on campus or through correspondence study.

The public is invited to attend off campus courses as free public lectures. During the first two weeks of lectures, anyone normally admissible who wishes to take a course for credit may apply to do so at the lecture location.

Correspondence Courses – Distance Education
The University of Waterloo operates one of the largest university-level distance education programs in Canada. More than 300 university credit courses are offered over the Fall, Winter, and Spring terms. Students should obtain a Calendar from the Correspondence Office to acquaint themselves with the offerings, the methods of operation, fees and the application deadlines.

For application deadlines see page 2:8 of this Calendar. General degrees in Arts, Environmental Studies, and Science may be earned entirely through correspondence. In working towards a degree, students may combine on-campus and off-campus courses with distance education courses. Fees for correspondence courses are the same as for courses offered on and off campus, except that a refundable deposit is required on the audio tapes used for lectures and on other special materials that may be required.

Complete details about UW's distance education courses and application forms are provided in the Correspondence Calendar. Copies may be obtained from:

Correspondence Office
University of Waterloo
Waterloo, Ontario N2L 3G1
(519) 888-4050
Fax: (519) 746-6393

The University of Waterloo
Part-Time Studies, Correspondence Courses, and Continuing Education
Special Programs

Special Programs

BScN Program for Registered Nurses
Registered nurses in Waterloo Region may take certain courses at the University of Waterloo which can be applied toward the Bachelor of Science-Nursing degree at the University of Western Ontario, McMaster University, Ryerson and the University of Ottawa. These courses are available on campus or through correspondence. Further information is available from Part-Time Studies, University of Waterloo.

Certified Employee Benefit Specialist Program
For individuals in the employee benefits field, the University offers evening courses leading to the designation of Certified Employee Benefit Specialist. Emphasis in these courses is on the fundamental principles underlying the design and operation of employee benefit plans. Additional details are available from Part-Time Studies, 888-4002.

Diploma in Land Management
A series of degree credit courses has been assembled by the University and the Association of Ontario Land Surveyors leading to a Diploma in Land Management. These courses provide university-level instruction in a broad range of subjects pertinent to the needs and interests of practising surveyors. Sufficient courses are available to complete the requirements by correspondence.

Diploma in Occupational Health for Registered Nurses
The University of Waterloo has assembled 10 half-credit degree courses plus a special 'nursing process' course pertinent to the needs and interests of practitioners in occupational health. These courses are available on campus or through correspondence.

Continuing Professional Education in Planning and Kinesiology
During the year, various courses and workshops are conducted for professionals working in the fields of Urban Planning and Kinesiology. For details on the current year's offerings, call 888-4002.

Continuing Education for the Police Profession
Courses taken part time at UW can qualify police officers for three designations awarded by the Canadian and Ontario Police Colleges:
- The Certificate in General Police Studies;
- The Certificate in Advanced Police Studies;
- The Diploma in Police Management Studies;

These courses can also count towards a Bachelor's degree at UW.

Other Continuing Education Opportunities
The University of Waterloo offers a variety of continuing education opportunities including the following:
Certificate and Diploma Programs in Economic and Industrial Development
- professional development courses in the School of Optometry
- the Diploma in Gerontology
- certificates in Social Work through Renison College
The University co-operates with a number of outside organizations regarding their program and designations.
Certain UW courses count for credit in the following:
- Appraisal Institute of Canada
- Canadian Credit Union Institute Fellows’ Program
- Canadian Hospital Association Course in Health Services Management
- Canadian Institute of Certified Administration Managers Program (CAM)
- Canadian Institute of Traffic and Transportation
- Certified General Accountants Association of Ontario (CGA)
- Institute for Certified Professional Secretaries
- Institute of Chartered Accountants of Chartered Accountants of Ontario (CA)
- Insurance Institute of Canada Fellowship Program
- Ontario Hospital Association Certified Health Consultant Program
- Ontario Municipal Management Development Program
- Purchasing Management Association of Canada
- Real Estate Institute of Canada (FRI)
- Society of Management Accountants of Ontario (RIA)

Non-Credit Courses
The University offers some non-credit courses throughout the year. Previous courses have included Understanding Microcomputers, and Effective Business Writing.

Cross-registration with Wilfrid Laurier University
Cross-registration procedures have been developed through a joint co-operative advisory council to enable full-time students to take advantage of courses available at both the University of Waterloo and Wilfrid Laurier University.
Both universities conduct pre-registration as part of the timetabling process for their own students who plan to return in the next academic year or term. Courses given at the other university as integral parts of specified academic programs or options may be chosen routinely during pre-registration. Requests to cross-register in other courses must be submitted on a special form, and are processed only after academic timetables are finalized.

The student's other courses to complete the examination report. A student's overall academic standing is determined solely by the home university.
Regulations concerning the dates for adding or dropping a course as well as petitions for cross-registering courses are governed by the student's home institution. Students should be careful to note the examination schedules of each university as they may not coincide.
For further details, contact the Registrar's Office.

Grading System

Grades for all courses appear on grade reports and transcripts either as one of 15 letter grades from A-plus through F-minus or as numeric marks on a percentage scale depending upon the faculty of registration.
Overall standings are reported in all faculties as numeric averages. The weighting factors are used for calculating overall averages for students on the letter grade system, and for converting assigned letter grades, where required, for students whose faculty is on the numeric system.
Please refer to the individual Faculty chapters for a complete explanation of the appropriate grading system.

<table>
<thead>
<tr>
<th>Assigned Letter Grades</th>
<th>Assigned Common Grades</th>
<th>Assigned Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>A+</td>
<td>95</td>
<td>90-100</td>
</tr>
<tr>
<td>A</td>
<td>89</td>
<td>85-89</td>
</tr>
<tr>
<td>A−</td>
<td>83</td>
<td>80-84</td>
</tr>
<tr>
<td>B+</td>
<td>78</td>
<td>77-79</td>
</tr>
<tr>
<td>B</td>
<td>75</td>
<td>73-76</td>
</tr>
<tr>
<td>B−</td>
<td>72</td>
<td>70-72</td>
</tr>
<tr>
<td>C+</td>
<td>68</td>
<td>67-69</td>
</tr>
<tr>
<td>C</td>
<td>65</td>
<td>63-66</td>
</tr>
<tr>
<td>C−</td>
<td>62</td>
<td>60-62</td>
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<tr>
<td>D+</td>
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<td>F</td>
<td>38</td>
<td>35-41</td>
</tr>
<tr>
<td>F−</td>
<td>32</td>
<td>0-34</td>
</tr>
</tbody>
</table>

* Actual assigned numeric grades are used in calculating averages for students in faculties on the numeric scale.

Non-Graded Standings
AEG Agreotat, credit granted due to illness
AUD Audit only, no credit granted
CR Credit granted
DNW Did not write examination, no credit granted
INC Incomplete course work, no credit granted
IP Course in progress, no grade assigned at this time
NCR No credit granted
NMR No mark reported
WD Withdrew after the drop deadline
Credit Weights and Degree Requirements

Courses offered at the University of Waterloo are given credit weights which vary from 0.25 to 1.00 credits or more. (Most courses have a 0.50 credit weight and are of a one-term duration.) However, the systems used to specify the number of courses that a student must take to satisfy minimum degree requirements may differ from faculty to faculty and program to program. The main systems used are: a credit-weight system, a term-course system, and a term system.

Programs using a credit-weight system designate the total number of course credits required for the degree. In this system the credit weights for passed courses are added together to determine total credits earned.

In the term-course system, degree requirements are specified in numbers of term courses. A term-course system may be defined to eliminate 0.25 credit courses from consideration, or may consider 0.50 and 0.75 credit courses as equivalent for degree-requirement purposes.

In the term system, a student is promoted on the basis of satisfactory completion of an entire term's work, and degree requirements are met by successful completion of the appropriate number of terms.

Course credit weights are used in all programs to calculate weighted averages for overall standing and promotion purposes. Credit weights are also used in calculating tuition fee amounts for individual courses. Part-time students especially should consider this fact in choosing courses.

Students should read the faculty and program regulations carefully to be sure that degree requirements are understood and met in the manner required by their program.

Examination Regulations

The following are excerpts from the Senate Regulations governing Examination Procedures. A booklet containing a more complete version of these regulations may be obtained from the Registrar's Office or from the office of the Dean in each Faculty. Specific regulations pertaining to each Faculty may be found in the individual Faculty program sections of this Calendar, Chapters 8-15.

Standard Practices with Respect to Illness

Illness may constitute an acceptable reason for not writing an examination. Students who miss examinations because of illness should inform their instructors and may provide a medical certificate documenting the precise period of absence and the nature of the illness. Where circumstances warrant special consideration, instructors may submit an AEG grade or a passing mark based solely on term work, or arrange for a deferred examination.

A student who becomes ill during the writing of an examination and is unable to continue should ensure, before leaving the site of the examination, that the officer in charge is notified of the situation. In addition, the student should notify the course instructor and supply proper medical documentation as soon as possible thereafter.

If a student completes an examination, even though he/she is ill, the subsequent grade obtained in the course must normally stand. Subsequent appeals on the grounds of illness may be considered if accompanied by proper medical documentation and submitted as soon as possible after the examination to the course instructor or to the Registrar's Office as required by Faculty regulations. The student's Department or Faculty may take the illness into consideration, and possibly alter academic decisions regarding eligibility to continue in the student's program of study, but the mark may not normally be altered on the student's official record.

Study Breaks

Each term the formal lecture period, as defined by the dates shown on pages 8-11 of this Calendar, normally ends two or three days before final examinations begin. The periods between the end of the formal lecture period and the beginning of final examinations shall be ones in which no instructor shall be permitted to administer, and no student shall be required to sit for, examinations, tests or lectures.

Final Examinations

No instructor shall be permitted to administer, and no student shall be required to sit for, final examinations during the formal lecture period. Final examinations shall be interpreted in the ordinary sense of the word, usually covering all, or a very substantial portion of, the material dealt with in one academic term or year.

Any unresolved disputes between an instructor and student concerning an interpretation of whether an exam should be regarded as a "final examination" will be decided by the appropriate Associate Dean(s).

If an instructor schedules a final examination during the formal examination period outside the time period 8:30 a.m. - 10:00 p.m., Monday through Saturday inclusive, suitable alternative time arrangements must be provided by the instructor, within the same Monday-Saturday time period, for any students who request such an alternative time. In the event of a general or major emergency, explicit University procedures will be available to allow for rescheduling of final examinations.

Other Tests and Examinations

Instructors are encouraged to hold other tests or examinations during the regularly scheduled class times for their courses. An instructor who chooses to schedule a test or examination to be held outside of, or to extend beyond, the regularly scheduled class time will be required to provide suitable alternative time arrangements for any students with legitimate conflicts.

Normally instructors may not hold major term tests in the last five teaching days of the lecture schedule in any term. Major term tests are those which account for more than 25% of the final course grade. Exceptions to the above must be approved in advance by the instructor's Department Chair and the Associate Dean (Undergraduate) of the Faculty concerned.
Requests for an Alternative Final Examination Time
A student requesting an alternative time for a final examination will be granted that request only in exceptional circumstances. Such circumstances include illness (with medical certificate) or other mitigating circumstances outside the control of the student. Elective arrangements (such as travel plans) are not considered acceptable grounds for granting an alternative examination time.

The decision whether to grant a student's request for an alternative examination time lies with the instructor of the course concerned as does the responsibility for making the alternative arrangements.

This policy may also be applied at the discretion of the instructor to tests and examinations other than final examinations.

Religious Holidays/Examination Schedule
The University acknowledges that, due to the pluralistic nature of the University community, some students may on religious grounds require alternative times to write examinations and tests. Accordingly, a student who requests an alternative examination or test time on religious grounds should consult with the Associate Dean of the Faculty offering the course regarding alternative arrangements. Such a request should be made within one week of the announcement of the test or examination date. For students in courses taught at the Church Colleges, the responsibilities of the Associate Dean in these procedures are exercised by the Dean of the College (or Head in cases where there is no Dean).

Student Access to Final Examination Papers
For many courses final examinations are a major component of student assessment and often contribute substantially to the final grade awarded. In addition, final examinations may serve an important educational purpose in indicating to students what, and how well, they have learned in the course. A course instructor may choose to use a final examination for one or both of these objectives.

The instructor may informally review the final examination paper with a student who requests it but not before the term grade reports are issued. Although this is not mandatory, instructors are encouraged to follow this practice. Where such an informal review process cannot be arranged, the following procedure is available to any student who wishes to obtain access to his or her final examination papers:

1. Every student may formally appeal a final grade in accordance with established Faculty appeal procedures.
2. Every student, as part of the process of appealing a grade, will be able on request to obtain supervised access to a copy of his or her final examination paper, to read only.
3. The student may provide written comments which will be forwarded along with the examination paper, to the faculty member for consideration in responding to the appeal.

The University of Waterloo
Examination Regulations
Student Academic Discipline Policy and Procedures

4. Faculties may broaden the privileges provided above but may not be more restrictive in their implementation of this proposal.

In this policy statement ‘final examination paper’ means the final examination question paper and the paper submitted by the student.

Retention of Examination Answer Papers
Students' answer papers related to mid-term examinations and final examinations are to be retained by the faculty member or instructor for the period of one year. After one year, they are routinely destroyed by shredding or other acceptable disposal methods.

Student Academic Discipline Policy and Procedures

The following is a summary of the disciplinary policies and procedures as contained in the Report of the Senate Committee on Academic Regulations and Discipline which was approved by Senate on April 20, 1981 and amended on May 15, 1989.

I. Any action which prejudices the integrity of the University's scholarly activities shall be considered to be an academic offence and shall be punishable by appropriate disciplinary action.

II. Academic Offences

Academic Offences shall include but shall not be limited to the following:

- Cheating on examinations, tests, assignments, or work term reports
- Impersonating another student or allowing oneself to be impersonated
- Plagiarism
- Theft of examination papers or other material, or the use of stolen material
- Falsifying academic records or submitting false credentials
- Submitting a false medical or other certificate
- Submitting work for one course which has been or is being submitted for another course without express permission to do so
- Behaviour which interferes with the rights of other students to pursue their studies
- Behaviour in a laboratory which endangers oneself or other students

III. Jurisdiction and Principles

The Associate Deans, Graduate and Undergraduate, of each Faculty are charged with enforcement of this policy. Problems which cannot be resolved informally between the professor(s) and the student(s) shall be referred to the Faculty Committee on Student Appeals by the Associate Dean. Formal charges concerning violations of this policy shall be heard by a tribunal chosen from the Faculty Committee on Student Appeals in question.
IV. Penalties
Should a student be found guilty of committing an academic offence, the penalty recommended will be one or more of the following:
• Reprimand
• Submission of a failing grade or an examination, test, assignment, course, or term
• Probation
• Suspension
• Expulsion

V. Right of Appeal
Students may appeal the decision of a Faculty Committee on Student Appeals to the University Committee on Student Appeals on grounds of denial of natural justice, substantive new evidence, or if the penalty imposed involves suspension for more than one year of expulsion.

Reference copies of the Policy are available from any of the following: Associate Deans, the Registrar's Office, the University Graduate Office, the University Secretariat and the Ombudsperson.

Student Appeal Policy and Procedures

Introduction
The Student Appeal Policy and Procedures, approved in 1989 by the UW Senate and Board of Governors, acknowledges the University's responsibility to deal fairly with student appeals, as noted in the first section of the policy which is cited below:

The University has the authority to determine who may register and who may graduate; in academic and non-academic decisions, it is the policy of the University to ensure that conditions of fairness prevail. It shall be the right of every student to appeal decisions based on University policies. The conduct of such appeals shall be based on the following principles:

• Fairness shall be the overriding consideration in dealing with student appeals. Fairness or natural justice requires that all parties be aware of the evidence to be considered and be given an opportunity to be heard during the process, and that individuals whose judgment is being queried must not sit in judgment of their own decisions;
• Sound academic decisions shall not be overturned on the basis of non-academic technicalities;
• Students are entitled to know the reasons for which decisions are made;
• The academic freedom of students shall be protected.

The steps a student may take to secure a remedy for the types of grievances described in the policy are detailed in the policy document, as are the associated time limits involved. Terms of reference for Faculty- and University-level Committees on Student Appeals (FCSA/UCSA) and procedural rules for the conduct of formal hearings are set out in appendices. Reference copies of the policy document are available from any of the following: Associate Deans, the Registrar's Office, the University Graduate Office, the University Secretariat and the Ombudsperson. A brief description of the major features of the policy, including a section entitled "Tips on Preparing an Appeal", is available from the Federation of Students and from the Graduate Student Association.

Appeals/Petitions
The policy classifies grievances into two types of appeals and differentiates them from petitions. Type 1 grievances allege errors in academic judgment; such grievances are handled at the Faculty level to ensure that people knowledgeable in the field judge the academic merits involved. Type 2 grievances are much broader, covering such matters as procedural error or instances of bias or prejudice; such grievances may ultimately be dealt with by a University-level committee.

Unlike grievances, which concern alleged errors in academic judgment or in procedure, petitions are requests from students seeking relief from normal Faculty or University rules and regulations because of special circumstances such as illness or bereavement. Petition forms (Form D) and advice on their completion may be sought from any of the following: the Registrar's Office in Needles Hall; undergraduate student advisors; Associate Deans. Consult individual Faculty sections of this calendar for Faculty-specific details.

Reassessment
Type 1 grievances include requests for reassessment of a student's work, and may involve an independent third party. Each Faculty has established the conditions under which students may request a formal reassessment of their work and the procedures for adjudicating such requests to ensure that students are treated fairly.

Procedures and Guidelines
Procedural steps for the resolution of grievances are detailed in the policy document in three main stages, with progressive stages becoming increasingly formal:

1. The informal inquiry stage is initiated by the student going directly to the appropriate instructor, officer, or University authority whose decision or action is being questioned. In general, students who wish to raise questions or who have a grievance are strongly encouraged to communicate informally with their instructors, Department Chairs, the appropriate Associate Dean of their Faculty and/or the appropriate administrative officer before seeking a review under formal procedures. Experience has shown that the great majority of questions or complaints can be resolved satisfactorily through informal communication.

2. Unresolved grievances may then proceed to the Formal Inquiry Stage which involves the student and usually the appropriate Associate Dean and Department Chair. A student initiates formal procedures by filing an Application for Formal Inquiry
or Reassessment (Form A), which may be obtained from Faculty Associate Deans. Form A must be filed within two weeks of receiving the response to the informal inquiry or when there is no timely response. Upon receipt, the Associate Dean ensures that a copy of Form A is submitted to the Chair (or Associate Chair) of the department involved or to the appropriate committee. The Chair or Committee investigates and makes a reasoned judgment concerning the grievance which is sent back to the Associate Dean who, in turn, conveys the Faculty’s decision to the student in writing with reasons.

3. The Formal Appeal Stage is the final stage and may involve the student and respondent appearing before a Faculty- or University-level tribunal, depending on the type of grievance and the outcome of a pre-hearing convened to determine, among other things, whether any or all of the issues in dispute may be resolved without recourse to a formal hearing before a tribunal. A student initiates this stage by filing an Application for a Formal Hearing, which may be obtained from Faculty Associate Deans for Type 1 grievances (Form B) or the University Secretariat for Type 2 grievances (Form C). An Application for a Formal Hearing must be filed within three weeks of receiving the decision on the Formal Inquiry. Upon receipt, a copy of Form B or Form C is made available to the respondent who must reply in writing; a copy of this reply is made available to the appellant. If, following the pre-hearing, there is to be a formal hearing, it will be conducted according to the detailed procedural rules described in the policy document.

The Ombudsperson may serve as a mediator in cases where the parties feel such involvement may be helpful in resolving a grievance. As noted in the policy document, a student must lodge a grievance (Form A) within six months either of being notified of an adverse decision or from the end of the term in which the alleged event or series of events occurred. Upon graduation, a student’s right to appeal ceases.

Grievances arising from unethical behaviour such as sexual harassment, discrimination or abuse of supervisory authority should be directed to the Ethics Committee (c/o University Secretariat, Needles Hall).

Ownership of Student’s Work

1. When a student submits work which is eligible for copyright* to the University, as a requirement of an academic program, the University acknowledges the student’s sole copyright ownership with the following conditions:
   a) The physical document (thesis, research paper, work term report, examination answer paper and such) submitted to the University by a student becomes the property of the University.
   b) With the exception of examination answer papers, the University receives a non-exclusive royalty free licence to:
      i) circulate the work as part of the University Library collection;
      ii) make copies or representations of the work for academic purposes within the University;
      iii) make copies of a thesis deposited in the University Library at the request of other universities or bona fide individuals or institutions;
      iv) microfilm the work and submit the microfilm to the National Library of Canada;
      v) publish the abstract of any work which is a student thesis.

2. Computer programs written or partially written by a student in support of a project, thesis, or other original work, may have potential value as a marketable intellectual property. The University acknowledges the student’s ownership rights in the same manner as for other copyright material, with the following exceptions:
   a) Students may be participating in software development as part of a process of research and development within a research group or department. In such circumstances, students may be asked to sign a waiver or assignment of software rights to the University, or to the supervising faculty member or research group.
   b) The University assumes a non-exclusive, paid-up, royalty-free licence to use, for the University’s administration, education and research activities, all software written using University facilities or written in support of academic work at the University. This license does not include the right to sublicense the software to third parties for commercial purposes, but may be extended in this sense by means of a written agreement between the student and the University.
   c) Students acquire no rights to software written under supervision in the course of employment by the University, for example as a research assistant or during a co-op work term. In cases where students are employed by faculty, or by recognized research groups, they should inquire into the software policy of that particular professor or group involved before undertaking extensive software development.

* In Canada, there are no formalities required to copyright original work. The author is the immediate owner of the copyright in the original work, except in certain cases where he or she is under an employment contract.

Student Academic Records

Student academic records shall be the property of the University; access to those records, and release of information concerning them, shall be governed by the general law and by the University's policies with respect thereto.
The University of Waterloo  
Policy on Research with Human Participants  
Student and Administrative Services

**Policy on Research with Human Participants**

The University of Waterloo requires that all research conducted by its faculty, staff and students which involves humans as research participants must be reviewed by the Co-ordinator of the Office of Human Research (OHR) for ethical acceptability, legal liability and medical advisability. Advisory to the Co-ordinator is the Committee on Research Involving Human Participants. The review process ensures that the research conforms to the requirements outlined in the OHR Guidelines for Research with Human Participants (Guidelines), and that the safety rights and welfare of the participants are adequately protected. The Guidelines provide information to University of Waterloo researchers about ethical issues and procedures which should be of concern to them when planning research with human participants (for example, confidentiality, risks and benefits, free and informed consent, etc.).

A definition of human research, as well as complete details about the application and review procedures are presented in the Guidelines. Copies of this document and application information are available through the OHR. In addition, the Co-ordinator is available to provide advice and can be reached at ext. 6005 (Needles Hall, Room 3015).

**Student and Administrative Services**

There are a number of centralized services which the student at the University may use as much or as little as he or she desires. More detailed information is available from each of the departments or organizations listed.

**Federation of Students**

The Federation of Students' role is to provide services and representation for undergraduate students at the University of Waterloo. All full-time undergraduate students are members of the Federation and may seek positions within its structure. The Charter of the Federation of Students, which guarantees certain rights and privileges to students, was approved by the Board of Governors of the University and then by the Provincial Secretary on April 27, 1967.

**Objectives**

The principal "Objectives" of the Federation are:
- To promote the welfare and common interests of the students of the University of Waterloo.
- To act as the representative of the students.
- To promote and maintain responsible student government.
- To promote and co-ordinate student participation in athletics, cultural and social activities.
- To promote and maintain communications between the student body and the duly elected and appointed authorities of the University of Waterloo.

**The Students' Council** is the governing body of the Federation and includes 32 elected students from all Faculties, St. Jerome's and Renison Colleges plus all Executive members. The functions of Council include upholding the above objectives, administration and control of finances and control of all Boards, Commissions and Standing Committees of Council. All activities are overseen by Council so make sure that your Faculty representatives attend Council meetings.

**The Executive Board** is composed of the principal officers including the President, Vice-President Operations and Finance, the Vice-President University Affairs, and all Board Chairs. The Board controls day-to-day administration, finance, and recommends policy to the Students' Council.

**The President** is the Chief Executive Officer of the Corporation and as such oversees all of the Federation's activities. The President is also the Executive's representative on the University Senate and the University Board of Governors.

**The Vice-President Operations and Finance** works with the Business Manager to oversee and formulate the Federation Budget, the Federation's business, and other ancillary services such as the Toronto Bus Service, the Landlord and Tenant Information Office, Women's Centre and Sexuality Resource Centre. This Vice-President also oversees the Boards of Entertainment, Communication and Creative Arts, and is responsible for the co-ordination of all Federation social events.

**The Vice-President University Affairs** is directly responsible to Council, to make sure members are informed of all matters pertinent to Federation policy. This position also is responsible for the supervision of the Speaker and Secretary of Council as well as the Boards of Academic Affairs, External Liaison, Public Issues Board, Internal Liaison, Women's Issues Board, and International Students Board. The VPUA is the external liaison with the three levels of government, the Ontario Federation of Students and the Canadian Federation of Students.

**The Board of Academic Affairs' responsibilities** include monitoring all University Academic Policies and Regulations and establishing communications with undergraduate students who sit as representatives on Administrative boards.

**The Board of Communications** is responsible for overseeing the various publications of the Federation. These include the federation video, as well as calendars, flyers and information published less frequently.

**The Board of Entertainment** helps to co-ordinate and supervise all campus-wide programs such as Orientation, Homecoming, Winter Carnival, Summerfest, pubs, and concerts.

**The Board of External Liaison** handles activities which connect and relate the student to the local, national, and international communities.
The Creative Arts Board provides assistance and participation to most on-campus musical, drama, and dance activities.

The Public Issues Board works to provide an out-of-the-classroom education, sponsors programs and speakers on campus to broaden the student-learning experience.

The Board of Internal Liaison is an important Board that co-ordinates and assists activities between the Federation, Societies, Residences, Clubs, and Athletics.

The International Student Board acts as the student body responsible for promoting international student activities and issuing and maintaining relations between the International students and the Canadian students at the University of Waterloo.

The Women's Issues Board works to articulate women's issues and concerns within the University community and to encourage women to participate in student and university governing bodies.

The Office of the Ombudsperson provides an impartial, independent and objective service to members of the University community. The primary objective of the Office is to ensure that a client's problem is dealt with in an equitable manner and that his or her rights are maintained.

The Ombudsperson deals with situations both academic and non-academic in nature. The Ombudsperson's Office is located in the Campus Centre, Room 150. Appointments can be made by calling ext. 2402 or by dropping into the Office. All letters and interviews are treated confidentially.

Other Federation Services include the GRAPHIX Factory — a Word Processing, Resume and Graphics Service, the Record Store, Campus Shop, Post Office, Used Books Store, the Bombsheeter Pub and Patio, Federation Hall, SCOOPS, and access to a non-pay phone (for local calls only).

Persons wishing information on any aspect of Federation activities are advised to write to the Federation of Students, Campus Centre, Room 235, or to telephone 888-4042.

Campus Centre
The Campus Centre (CC), with the assistance of a Student Board, offers a place for the University community to meet, relax and take advantage of the many facilities in the building. Open around the clock every day of the year, the CC offers non-stop music, free movies, craft fairs, occasional exhibits, live entertainment, magazines, games, pinball and arcades. More information is available from the Turnkey on duty in the Great Hall of the Campus Centre.

The Student Newspaper (Imprint)
Imprint is the newspaper of, by, and for the students of the University of Waterloo. It is dedicated to the intellectual analysis and coverage of news, arts, sports, and issues of the day. It is a non-profit corporation without share capital, and is both student-owned and student-operated. Located in the Campus Centre, Room 140, Imprint publishes weekly in the Fall and Winter terms, and bi-weekly over the Summer.

Student volunteers are needed to research and write articles, review everything from books to concerts, take photos, develop and print photos, lay out pages and run sections. Experience for any position is not necessary because training is provided in all areas.

Imprint can be reached from 9:00 a.m. to 5:00 p.m. (or often later) at 888-4048 or University ext. 2331 Monday through Friday. Inquires should be directed to the Editor.

Athletics
The University of Waterloo offers a broad and complete range of athletic programs. The University holds membership in the Ontario Universities Athletic Association with 16 other Ontario universities, and competes in over 35 sports in this inter-university league. Campus Recreation provides an intramural program at a competitive, recreation, and instructional level, including such sports as slow-pitch, fitness, scuba, ballroom dancing and many others. The Physical Activities building, a golf course, numerous outdoor fields, Seagram Stadium, Columbia Icefield arena and other facilities, provide excellent accommodation for these well-rounded programs.

More information on any aspect of the University of Waterloo athletic program may be obtained by contacting the Athletic Department, Red North entrance of the Physical Activities Building.

Book Store
The Book Store is located in South Campus Hall and provides students with all required textbooks, stationery, engineering, art supplies and approximately 25,000 titles of non-required books.

Book Store Directory
On the main floor you will find Humanities textbooks, general and reference books and stationery supplies. Textbooks for the following disciplines are stocked on the lower floor: Accounting, Engineering, Economics, Math and Computer, Sciences, Applied Health Sciences and Environmental Studies. Textbooks are arranged by department (subject) and by author.

Pricing Policy
The Book Store sells required textbooks and mandatory supplies at discounted prices. This practice is a University policy and will continue to be applied during the coming academic year.

We provide, at no charge, a special order service for books that are not generally stocked. If a title is "in print", we can almost always order it.

Hours
Book Store hours are 9:00 a.m. to 5:00 p.m. Monday through Friday. Extended hours will be posted for peak sales periods at the start of each term.
Refund Policy
COURSE BOOKS: the price will be refunded in full during the period and up to two weeks after the final day of each term registration provided THE BOOK IS IN MINT CONDITION AND A RECEIPT IS PRESENTED. All other books and stationery items: 72 hrs.
Textbook Information – ext. 3996
General Information – ext. 2902

UW Gift Shop
Located across from the Book Store, the UW Gift Shop has a variety of crested items available as well as a wide selection of cards and gifts.

Art Gallery
The UW Art Gallery is located in the foyer of the Theatre of the Arts, Modern Languages Building. A varied program of seven travelling exhibitions, including works on paper and canvas, textiles, photography, and sculpture are presented each year. Exhibitions of Fine Arts alumni and fourth-year graduating students’ work are among the presentations. During the Summer months, selections from the University’s permanent collection are exhibited.
The Gallery hours are 11:00 a.m. to 4:00 p.m. Monday through Friday and from 2:00 p.m. to 5:00 p.m. on Sunday. The Gallery is not open Sundays during the Summer months or on statutory holidays. There is no admission charge. For gallery information, call ext. 2439.
The University’s permanent collection of 279 works, of all mediums, are found in offices campus wide.
A small Gallery in Needles Hall, Room 3051, also offers a changing series of exhibitions.
There are 21 major sculptural art pieces located throughout the campus.

Theatre Centre
Room 161, Hagey Hall of the Humanities
Entertainment is available on campus throughout the Fall and Winter terms in UW’s two attractive theatres, with special discounts for students.
In addition, the Centre co-operates with the Federation of Students and other campus organizations in many other university-based theatrical events. The two theatres are also rented from time to time by community organizations such as local dance schools, the Kiwanis, the Gilbert and Sullivan Society and others. The City of Waterloo uses the two theatres as venues for their professional theatre season which includes drama, comedy, and music. The UW Theatre Centre general offices are located in Room 161, Hagey Hall of the Humanities, at ext. 2126 or 2127. Free brochures and tickets are available on campus, or call 885-4280 for immediate mail services. The UW Theatre Centre box office is a Ticketmaster (formerly known as BASS) ticket outlet, supplying tickets to the Humanities Theatre, the Theatre of the Arts and any event on the Ticketmaster system. Visa and Mastercard are accepted.

The University of Waterloo
Student and Administrative Services

Counselling Services
Room 2080, Needles Hall
Professionally trained counsellors are available to help students with educational and career decisions as well as personal and social concerns. Individual interviews, workshops and study skills classes are some of the services which Counselling offers to students. Appointments can be made by calling extension 2655 or by dropping into the offices on the second floor of Needles Hall. Hours are 9:00 a.m. to 5:00 p.m., Monday through Friday.

Career Services
Career Services facilities and services are available to all UW students. Further information can be found in the Career Services section of Chapter 5, pages 5:8 and 5:9.
- Graduating Students Interviews
- Alumni Referral Service
- Career Preparation
- Student Career Advisors
- Career Resource Centre

Health and Safety Department
Health and Safety Building
The Health and Safety Department includes the Medical Clinic centrally located across from the Campus Centre. The clinic provides comprehensive care to all students and emergency care to others on campus. Physicians, nurses and counsellors are on staff at the clinic which is open Monday to Friday from 8:30 a.m. to 5:00 p.m. For emergencies, there is a doctor on call who can be reached 24 hours a day by dialing 888-4096. Physicians’ fees at Health Services, as well as laboratory work, x-rays, and most referrals are paid by the Ontario Health Coverage (OHIP) or other provincial health plans. More details are available at the Health and Safety Department.
All full-time students are also covered by a Student Supplementary Health Insurance Plan sponsored by the Federation of Students which provides partial payment for prescriptions and other services.

Sexual Harassment Advisor
The University of Waterloo desires to create a work environment which supports, nurtures, and rewards its members on the basis of such relevant factors as work performance and achievement. Sexual harassment, discrimination, and the abuse of supervisory authority, for example, are antithetical to this environment. All forms of sexual harassment are covered by the University’s policies (see in particular Policy 33, Ethical Behaviour). The Sexual Harassment Advisor, available through the Health and Safety Office, provides information and advice (on a completely confidential basis) to all members of the University community in matters pertaining to sexual harassment.
Alternative resource personnel include: Counselling Services, members of the Ethics Committee, the Faculty and Staff Associations, the Health and Safety Department, the Ombudsperson and the Personnel Department.
Mature Student Services

The Mature Student Services office provides both academic information and support services for students who have been away from formal education for some years. Help with application for admission, pre-registration, course changes and withdrawals is available, as well as up-to-date information on university services and regulations.

Services include a networking file, a learning skills package, a library of cassette tapes, and a monthly Newsletter. Throughout the year, the office organizes a variety of events that are geared to the needs of older students.

Appointments for individual advice and counselling can be made by phone (ext. 2429) or by visiting the office in the Modern Languages Building, Rooms 224 and 225. Office hours are 8:30 a.m. to 4:30 p.m., Monday through Friday.

Child Care

There are three licensed child care facilities located on the University of Waterloo campus. On the north campus, just off Columbia Street, are the Hildegard Marsden Co-operative Day Nursery and the Klemmer Farmhouse Co-operative Nursery. The Marsden centre offers professional services for infants (from 3-18 months) and toddlers (from 18-33 months). Nine fully qualified staff members plus a cook and a full-time administrator operate this year-round facility. Fees vary according to the child's age. For more information, call ext. 4750. The Klemmer Farmhouse offers professional full- and half-day programs for two- to five-year-old children. Four staff members operate this year-round nursery with the co-operative assistance of parents. Fees vary depending upon the time a child spends at Klemmer. For more information, call 885-5181.

On the south campus, just off University Avenue, is a child care facility known as the Paintin' Place Co-operative Day Care in the Married Students' Apartments complex. It too offers year-round nursery with the co-operative assistance of parents. Fees vary according to the amount of time a child spends at Paintin' Place. For more information, call ext. 4030.

Office of the Registrar

Needles Hall

Student Admissions, Secondary School Liaison, Registration, Records and Financial Aid for undergraduate students are administered by the Registrar's Office.

Office of Research

The Office of Research is responsible for providing the overall administration for research including, but not limited to: acting as a centre of communications between granting agencies and faculty; assisting faculty to obtain grants and negotiating contracts for undertaking research; ensuring that University policies and agency/sponsor requirements are met; and providing financial administration, monitoring and reporting to researchers, University administration and external sponsors.

In addition to the sponsored grant and contract research the Office of Research is also responsible for the co-ordination of software licensing, assisting with the development and administration of international programs and the future development of an industrial research/technology park on the north campus.

1. Research Grants: Assistance is made available on preparation and forwarding of grant applications, including liaison with faculty representatives and individual consultations. A resource centre containing information on available grants, application forms and procedures is maintained in Room 3014, Needles Hall.

2. Contract Research: The Office provides a working liaison between the University and all organizations for contracted research. It offers assistance and draws upon the resources of all Faculties of the University in administering research services on a contractual basis.

3. Research Involving Human Participants: The Co-ordinator (Human Research), in consultation with members of the Committee on Research Involving Human Participants, reviews University research proposals involving human subjects for ethical acceptability, legal liability and medical advisability. This process ensures that the research conforms to the requirements outlined in the Office of Human Research Guidelines for Research with Human Participants, and that the safety, rights, and welfare of the participants are adequately protected. The Co-ordinator is also the official liaison between the University and local public and separate school boards, and is responsible for approving and making arrangements for all studies which require the participation of elementary and secondary school students and/or teachers from either of the two school boards. (For more information, see Policy on Research With Human Participants, page 1:12.)

4. Research Involving Animals: The Committee on Animal Care reviews University research proposals involving animals according to the requirements of The Animals for Research Act and the Canadian Council on Animal Care Guide. The Co-ordinator of Animal Care monitors the facilities on-campus and reports to the Dean and to the Committee on activities and procedures relating to the care of research animals.

5. International programs: Assistance is available on preparation and submission of international projects. Liaison is maintained with government and other international funding agencies. Financial administration and logistical assistance is provided in the Office of Research.

6. Research/Technology Park: The University is promoting the development of an industrial Research/Technology Park on the North Campus. This initiative will further enhance industry and university cooperation at all levels.
7. **Technology Transfer and Licensing Office:** This office has been established to facilitate the identification of commercially significant research-based technologies. It assists the University research community in technology-transfer and commercialization of research spin-off technologies, including assistance in patenting, licensing, and the sale and protection of technologies on behalf of the researchers and the University.

8. **National Research Council (NRC):** To assist small and medium companies, NRC has made arrangements with the university to accommodate and support a Field Advisory Service representative on the campus as an adjunct to the Office of Research.

**Residences**

Accommodation is available at the University for approximately 4,500 students. There are two large undergraduate residences, Village I and Village II; a townhouse complex; five smaller Federated and Affiliated College residences, St. Jerome's, Notre Dame, Conrad Grebel, Renison, and St. Paul's; the Minot Hagey residence for graduate students; and the Waterloo Co-operative residence. The Co-op residence is situated just off campus, and is owned and operated by students. Also situated just off campus is the University Married Students' Apartments complex which contains 240 one-bedroom and 360 two-bedroom apartments. An off-campus housing information service is also provided. Inquiries should be made as follows:

For Village I, Village II, townhouses, and Minot Hagey write:

- Housing Office
- Village I
- University of Waterloo
- Waterloo, Ontario N2L 3G1
- or phone (519) 884-0544

For off-campus information write:

- Off-Campus Housing Office
- Village I
- University of Waterloo
- Waterloo, Ontario N2L 3G1
- or phone (519) 888-4408

For Federated and Affiliated Colleges, Waterloo Co-op Residence, and Married Students' Apartments, write:

- Conrad Grebel College
- Westmount Rd. N.
- Waterloo, Ontario N2L 3G6
- or phone (519) 885-0220

- Married Students' Apartments
- 159 University Ave. W.
- Room 0104
- Waterloo, Ontario N2L 3E8
- or phone (519) 885-4040

- Notre Dame College
- Waterloo, Ontario N2L 3G2
- or phone (519) 884-2460

**Facilities for Students with Disabilities**

The University has developed a number of services and has available assistive devices for use by students with disabilities:

- All buildings on campus have at least one wheelchair-accessible entrance. Most buildings have wheelchair-accessible washrooms or are linked to a building that does. Improvements are continually being made to improve campus accessibility.
- Village I has wheelchair-accessible rooms and disabled students are given priority for acceptance. Students may request a trial stay in residence prior to making application to assess and evaluate the facilities.
- A Centre for Sight Enhancement, with up-to-date technical equipment, has been established in the School of Optometry to aid visually disabled students. For information call ext. 3581.
- The Library has listening rooms equipped with a number of technical aids and equipment. The Library staff will also provide assistance for disabled students. The Co-ordinator of Services for Persons with Disabilities will assist disabled students to access campus services and facilities. For information or assistance, call 888-4635. Off-campus TDD users may call 888-4044. On-campus TDD users call ext. 4044.
- Other campus services and facilities available to TDD users include:
  - Correspondence Office 888-4794
  - Dana Porter Library Information Desk 888-4772
  - Davis Centre Library circulation 888-4773
  - information desk 888-4771
  - Security Office 888-4811

**International Student Office**

The International Student Office (ISO), located on the second floor of Needles Hall (within Counselling Services), aids international students through its special programs. Information is provided on many aspects of living in Canada – immigration regulations, community services, legal problems and cultural adjustment. Programs include Host Familios, English conversation class, English tutors, TOEFL preparation courses, temporary housing, emergency loans and U.S. visas.
All students from outside Canada are invited to visit the International Student Office, Needles Hall, Room 2080, ext. 2814. Office hours are 8:30 a.m. to 4:30 p.m., Monday to Friday.

Teaching Resource Office
The Teaching Resource Office (TRO) of the University of Waterloo was established in 1978, following the recommendation to the Undergraduate Council of Senate by the Vice-President Academic “that the University appoint a person to act as a teaching consultant to the Faculties.” Terms of reference for the Teaching Resource Person include providing assistance to individual faculty members in improving their teaching performance, offering assistance to departments on teaching methods and evaluation of learning (including advice on the training of teaching assistants), and keeping the University community informed about developments and innovations relevant to teaching and learning in higher education. In 1985 the TRO became part of the Teaching Resources and Continuing Education Office (TRACE) which also has responsibility for the University's continuing education offerings, part-time studies, and the correspondence program. The office is located in the Math and Computer building, Room 4055 (ext. 3132). A library of computer-catalogued resource materials on teaching is held in the TRACE office.

Visitors Reception Centre
The Secondary School Liaison Office invites students to visit the Centre which is located in the Optometry building, Room 306. From September to April, the Centre is open daily, Monday to Friday, from 8:30 a.m. to 4:30 p.m. Campus tours leave from the Centre at 10:30 a.m. and 1:30 p.m. and are about 1 1/2 hours long. Students can also arrange to visit specific departments and meet with Faculty members about programs or facilities. Many Faculties have set aside all or several Wednesdays to provide students with the greatest exposure to lectures, other students, and faculty. Visitors to the campus are invited to phone to make arrangements. The number to call is (519) 885-1211, ext. 3614.

Although students are welcome to visit the campus at any time, regular tours are not scheduled from May to August, nor is the Visitors Reception Centre open for this term. Students may tour the campus on their own or call the appropriate faculty office if they wish to make special arrangements. The Secondary School Liaison Office will assist, if necessary, with these arrangements.

Writer-in-Residence
Each year, with the support of the Vice-President, Academic, each of the Church Colleges and the Canada Council, the University appoints a Writer-in-Residence. This writer works with the members of UW's active writing community, made up of faculty, staff and students. As well, a resident writer gives members of the University community contact with the current Canadian literary scene. Past writers have included Harold Honwood, Susan Musgrave, Graeme Gibson, Sandra Birdsell and Sean Virgo. At present, the position is held by Greg Cook, poet, and past-president of the Canadian Writers' Union. His office is at St. Jerome's College.
The Warrors Rand, with Pounce de Lion (the UW Alumni mascot) conducting, strike up an impromptu open-air recital to rally Campus Day participants.
General Information

Applicants seeking admission to undergraduate programs are required to have suitable and adequate preparation to enable them to undertake degree studies at the University. Before submitting an application, prospective students should read carefully the description of the program they wish to study and then review the admission requirements to determine whether their background qualifies them for consideration. The admission requirements apply to all applicants who wish to pursue degree studies on a full-time or part-time basis, including studies by correspondence.

Candidates may apply for admission to the programs listed in the various faculty sections of this Calendar. All applicants will be considered for admission to the University unless St. Jerome's College or Renison College is specified.

All correspondence should be directed to the Assistant Registrar for the Faculty to which the candidate is applying.

Detailed information regarding admission requirements is available from the Assistant Registrar for each Faculty.

Applicants are advised to outline thoroughly their educational background in order to facilitate the admission process. The admission information and requirements set forth in the Calendar are applicable for admission beginning in May, 1991.

Authority to Audit

All applicants for admission to the University will be considered by the Admissions Committee for the Faculty to which admission is sought. No final decision regarding the acceptability of an applicant will be made by an individual or group without the authority of the appropriate Admissions Committee.

The University reserves the right to refuse admission to any candidate and to refuse re-admission if, in the opinion of competent authority, a student will not profit from University studies.

The University reserves the right to withdraw the Offer of Admission if the applicant fails to meet the minimum requirements for admission or any other condition stated on the Offer of Admission.

St. Jerome's College

St. Jerome's registers students in the Regular or Co-operative system of study in the Faculty of Mathematics and the Regular system of study in the Faculty of Arts. It is also possible for students to register at St. Jerome's in the Co-op Honours English program or Co-op Applied Studies program in the Faculty of Arts.

Inquiries and correspondence should be directed to:
The Registrar, St. Jerome's College.

Admissions

General Information

General Admission Requirements

Renison College

Applicants may apply for the Social Development Studies Program and for Arts Regular Programs through Renison College. Renison College applicants should indicate "Renison College" clearly on the application form. All transcripts and documents should be sent directly to the College.

Inquiries and correspondence regarding admissions should be directed to:
The Registrar, Renison College

General Admission Requirements

The minimum admission requirements are expressed in terms of the Ontario Secondary School curriculum.

In many programs the number of qualified applicants may exceed the number of places available. The possession of the minimum requirements guarantees only that the application will be considered seriously. The admission process is actually a competition for the places available, and the majority of the students admitted usually have averages well above the minima.

Applicants educated outside of Ontario must submit evidence of having obtained a level of education equivalent to that required of applicants from Ontario (see chart on pages 2:5-2:7) as well as meeting admissions average requirements.

Normally Ontario Secondary School applicants who are refused admission to a particular program will automatically be considered for admission to other programs for which they satisfy the specific subject and marks requirements. Applicants who are not currently in Ontario Secondary School and who are refused admission to the program to which they applied may be considered for other programs of their choice.

English Proficiency Test

Applicants whose native language is not English are advised to take the "Test of English as a Foreign Language" (TOEFL). Normally, a score of 600 is required to satisfy the Admissions Committee that the applicant's knowledge of the English language is adequate to pursue university studies successfully. The expenses involved in administering the test must be borne by the applicant.

Permanent Resident Status

Because of the nature of the Co-operative programs at the University, in which a student alternates four months of study on campus with four months of practical work experience in business, industry, or government, applicants from other countries must obtain Permanent Resident Status in Canada before applying for admission to a Co-operative program. Until such proof of Permanent Resident Status is received, applicants will be considered for a comparable program, if available, offered under the Regular system of study.
Notice of Nondiscriminatory Policy as to Students

The University of Waterloo admits students of any race, colour, and national or ethnic origin to all the rights, privileges, programs and activities generally accorded or made available to students at the University. It does not discriminate on the basis of race, colour, national and ethnic origin in administration of its educational policies, admission policies, scholarship and loan programs, and athletic and other university-administered programs.

Applicants to Year One

A) Applicants From Ontario Secondary Schools
See the 1991-92 Admission Requirements for Year One Programs on pages 2:5-2:7 for general admission requirements and specific program requirements.

B) Equivalent Certificates
All applicants are required to hold the specific subject requirements indicated on pages 2:5-2:7 in addition to the equivalent level of education.

Applicants are required to submit official transcripts for all years spent in secondary and post secondary education. Transcripts must indicate subjects studied, the grades received and an interpretation of the grading systems used.

Applicants from Other Canadian Provinces

<table>
<thead>
<tr>
<th>Province</th>
<th>Grade</th>
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<tbody>
<tr>
<td>Alberta</td>
<td>Grade 12</td>
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<tr>
<td>British Columbia</td>
<td>Grade 12</td>
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<tr>
<td>Manitoba</td>
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<tr>
<td>New Brunswick</td>
<td>Grade 12</td>
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<td>Newfoundland</td>
<td>Year 1 Memorial University</td>
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<tr>
<td>Northwest Territories</td>
<td>Grade 12</td>
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<tr>
<td>Nova Scotia</td>
<td>Grade 12</td>
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<tr>
<td>Prince Edward Island</td>
<td>Grade 12</td>
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<tr>
<td>Quebec</td>
<td>First Year CEGEP program or equivalent</td>
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<tr>
<td>Saskatchewan</td>
<td>Grade 12</td>
</tr>
<tr>
<td>Yukon Territory</td>
<td>Grade 12</td>
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</tbody>
</table>

Applicants from other Countries

Countries following a “British” System of Education
General Certificate of Secondary Education or equivalent with Passes in at least five subjects, two of which must be at the Advanced Level.

International Baccalaureate
Passes in at least six subjects, three Higher Level and three Subsidiary Level with a grade total not less than 28.

Hong Kong
Hong Kong Certificate of Education (English) and University of Hong Kong Matriculation (Advanced Level) with Passes in at least five subjects, two of which must be at the Advanced Level. (Applicants with three or more University of Hong Kong Advanced Level subjects will also be considered.) Chinese University of Hong Kong First Year standing with courses appropriate to program.

Europe
Maturity or Matriculation Certificate.

India
B.A. or B.A.Sc. (first or second division).

Central and South America
First-year university with a standing of at least B –

Countries Using French System
Baccalauréat Passable.

United States of America
High School Diploma with exceptionally high standing, and Advanced Placement Examinations in prerequisite subjects or first-year university standing in acceptable subjects from an accredited institution.

Other Countries
Normally the Secondary School program which allows applicants to be admitted for first-year university studies in their home country is acceptable provided that the educational system is at a similar level to the educational system in Ontario.

Candidates should contact the Registrar’s Office well in advance of the desired session for an assessment of eligibility. As much information as possible should be provided in the initial inquiry. Official documents submitted in a language other than English must be accompanied by a notarized English translation.

Other Applicants

Applicants who are not considered for admission on the basis of Ontario Secondary School standing or equivalent are considered under the following broad categories. These categories serve to identify general areas of academic preparation.

Mature Student Admission
Individuals who do not meet the normal requirements for admission but who can offer clear evidence of their ability to undertake and manage university studies and who have been away from formal education for some time, in no case less than two years, may be considered for admission as a mature student. In the case of the Faculty of Arts, if you have been away from formal education for some time, normally five years or more, but in no case less than two years, and do not meet the normal requirements for admission, you may be considered for admission as a mature student.

Although the University of Waterloo does not automatically offer admission to mature applicants, the
Faculty Admissions committees carefully consider previous academic records, resumes and other biographical material before determining admissibility. For example, Admissions Committees for faculties where there are specific subject requirements in the areas of Mathematics and Science will expect confirmation that the applicant has a background equivalent to that provided by OAC Mathematics and Science courses. Admissions Committees for less technical programs will review the applicant's personal and professional development, formal training, work experience and community service before making a decision.

Applicants who do not qualify for full-time degree studies may be considered for admission to a part-time non-degree program in any faculty but the Faculty of Engineering.

Applicants applying as mature students are advised to contact the Assistant Registrar of the desired faculty to discuss admissibility and appropriate qualifying work.

Non-Degree Status
Mature students or others who are not interested in pursuing a degree may apply for admission on a non-degree basis. Credit courses successfully completed by students admitted under this provision will normally count toward a degree if the student is admitted later as a degree candidate.

Post-Degree Status
Students who hold a degree recognized as equivalent to a Canadian university bachelor's degree, or a graduate degree, and wish to register in one or more undergraduate courses, but are not proceeding to an undergraduate degree at this university, may be admitted and registered as post-degree students. Normally courses taken this way are not credited towards a graduate degree at the University of Waterloo.

Advanced Standing
Applicants to advanced years must specify the Faculty to which they are seeking admission, the program they wish to study, and the level of admission sought. All programs, with the exception of Architecture, Engineering, Independent Studies and Optometry operate on a course credit system where a student's progress is measured by courses completed rather than by years completed.

Applicants to Faculties which operate under the course credit system will have previous work evaluated on an individual course basis. For other applicants advanced standing will be determined to the appropriate year or term. Applicants are expected to submit course descriptions, in addition to an official academic transcript from the institution(s) they have previously attended or are presently attending. The provision of such information will greatly facilitate the evaluation of previous work and the consideration of possible transfer credits.

Transfer Credit
Transfer credit will depend upon the program applied to, the relevancy of the previous program studied, and approval from the appropriate department that such courses are to be credited to the student's program. As the specific transfer credit policies vary with each Faculty, students are advised to refer to the Faculty sections in this Calendar for detailed regulations.

Applicants from Ontario Colleges of Applied Arts and Technology
As a general policy, applicants who have achieved first class honours or high second class honours in each of the three years of a program at an Ontario College of Applied Arts and Technology are considered for admission with advanced credit for as much as one year of a degree program.

Applicants who have completed two years with first class honours or high second class honours are considered for admission to Year One. Each application will be considered on its merits by the Admissions Committee of the desired Faculty.

Letters of Permission
In addition to completing the appropriate application form, applicants wishing to take a course on a "Letter of Permission" must obtain a Letter of Permission form from their "home" university specifying the courses to be taken. Usually no further documents are required.
### Specific Admission Requirements and Recommendations for Year One Programs

<table>
<thead>
<tr>
<th>Faculty/Program</th>
<th>Requirements</th>
<th>Recommendations</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Ontario Universities' Application Centre (OUAC) codes for the various programs are given below to assist applicants in completing their applications.</td>
<td><em>See Note below.</em></td>
<td>The following recommendations are intended to provide additional academic advice which applicants should consider when planning their university preparation programs. Courses listed here are not required for admission but are recommended because applicants may find this preparation beneficial during their university studies.</td>
<td>The following comments are intended as guidelines only. Competition for available places each year may result in changes to the factors which affect admission decisions. Competition is keen for all programs because the number of qualified applicants usually exceeds the number of places available. Since factors other than marks are often considered in the admissions decision, students interested in particular programs are encouraged to apply regardless of their expected average. Students are encouraged to achieve as much breadth of preparation as possible in the course of their secondary school studies.</td>
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<tr>
<td>Applied Health Sciences</td>
<td>Six Ontario Academic Courses</td>
<td>Applicants are encouraged to include OAC English in their program.</td>
<td>Applicants living within a reasonable commuting distance of Waterloo must attend an audition class in the spring. Applicants unable to travel to Waterloo must submit a letter explaining their educational goals as well as at least one letter of reference from their dance instructor (certificates from the RAD or I.S.T.D. will also be considered), and will be required to take an audition for placement during the first week of classes.</td>
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<tr>
<td>Dance</td>
<td>OUAC Code: WO</td>
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<tr>
<td>Health Studies</td>
<td>Six Ontario Academic Courses including: Biology Chemistry</td>
<td>Applicants are encouraged to include OAC Calculus in their program as preparation for first-year Chemistry. OAC Calculus is strongly recommended for applicants considering the Pre-Health Professions Option.</td>
<td>Applicants planning to enter the Joint Honours program in Health Studies/Kinesiology must fulfill the Kinesiology admission requirements. Applicants are encouraged to complete an Admission Information Form.</td>
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<tr>
<td>OUAC Codes:</td>
<td>Regular - WF Co-op - WW</td>
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<tr>
<td>Kinesiology</td>
<td>Six Ontario Academic Courses including: Calculus Chemistry one of Biology or Physics</td>
<td>Physics is especially recommended.</td>
<td>Applicants should be aware that the Kinesiology program includes required university courses in Biology, Calculus, Chemistry, Computer Science, Physics, Psychology and Sociology. Applicants are encouraged to complete an Admission Information Form.</td>
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<tr>
<td>OUAC Codes:</td>
<td>Regular - WK Co-op - WL</td>
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<tr>
<td>Recreation and Leisure Studies</td>
<td>Six Ontario Academic Courses</td>
<td>Applicants are encouraged to include OAC English and one OAC Mathematics in their program.</td>
<td>Applicants with overall averages above 70% are given first consideration. Applicants should be aware that, although this is a social science program, courses in Computer Science and Statistics are included in the program. Applicants are encouraged to complete an Admission Information Form.</td>
</tr>
<tr>
<td>OUAC Codes:</td>
<td>Regular - WX Co-op - WZ</td>
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<tr>
<td>Arts</td>
<td>Six Ontario Academic Courses including: English and one other Arts-related course.</td>
<td>Applicants are expected to choose their other Arts-related course(s) from OAC courses such as English, History, Languages, Social Sciences, Fine and Performing Arts. A Mathematics course is strongly recommended for applicants who are considering social science programs. Calculus is preferred for applicants interested in majoring in Economics.</td>
<td>Recently, most students admitted have had averages of 70% or higher. Applicants with lower averages may be considered on the basis of other indicators, including information provided on the Arts Admission Information Form. Admission to departmental programs, including Co-op, occurs following Year One and is based on academic performance in Year One.</td>
</tr>
<tr>
<td>OUAC Codes:</td>
<td>University - WA St. Jerome's - WJA Renison - WRA</td>
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</table>

*Note: Ontario secondary school students seeking admission must present the Ontario Secondary School Diploma (OSSD) including a minimum of six Ontario Academic Courses (OAC). An overall average of 65% on six Ontario Academic Courses is the minimum required for consideration, but higher averages may be required for admission to individual programs in which the demand for places by qualified applicants exceeds the supply of places available. The actual averages required for admission to particular programs are determined each year on the basis of the number of applicants and the qualifications of these applicants. The admission average is calculated using the best six marks which include marks for courses required for admission. The length of time taken by an applicant to complete the secondary school program will not of itself be a determining factor in the admission decision whereas the student has processed normally through the program without receiving any form of reassignment. The University reserves the right to withdraw the offer of admission made to an applicant on the basis of improper marks or incomplete standing if the applicant fails to meet the academic requirements with a minimum final admission average of 65% on six Ontario Academic Courses, or equivalent, or any specific final average or condition stated on the Offer of Admission.*
<table>
<thead>
<tr>
<th>Faculty/Program</th>
<th>Requirements</th>
<th>Recommendations</th>
<th>Comments</th>
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</thead>
<tbody>
<tr>
<td>Renison-Social Development Studies</td>
<td>Six Ontario Academic Courses including English and one other Arts-related course.</td>
<td>Applicants are expected to choose their other Arts-related course(s) from OAC courses such as English, History, Languages, Social Sciences, Fine and Performing Arts. A Mathematics course is strongly recommended.</td>
<td>Recently, most students admitted have had averages of 70% or higher. Applicants with lower averages may be considered on the basis of other indicators, including information provided on the Arts 'Admission Information Form'. Applicants who are not admitted to Social Development Studies are considered for Regular Arts through Renison.</td>
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<td>(Regular)</td>
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<tr>
<td>OUAC Code: WRS</td>
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<tr>
<td>Accountancy Studies</td>
<td>Six Ontario Academic Courses including English.</td>
<td>Applicants should include OAC Calculus and one other mathematics, preferably Finite Mathematics, in their program. Students lacking these courses must rectify this deficiency in Year 1.</td>
<td>Applicants with averages over 80% will be given first consideration. Students will register in either Co-op Chartered Accountancy or Co-op Management Accountancy. Applicants not admitted to Arts Accountancy Studies (Co-op) will be considered for admission to Arts Regular only, when interest in this alternative is well-supported on the Arts 'Admission Information Form'.</td>
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<tr>
<td>(Co-op)</td>
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<tr>
<td>OUAC Code: WAA</td>
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<tr>
<td>Applied Studies</td>
<td>Six Ontario Academic Courses including English and one other Arts-related course.</td>
<td>Applicants are expected to choose their other Arts-related course(s) from OAC courses such as English, History, Languages, Social Sciences, Fine and Performing Arts and are also encouraged to include courses from Mathematics and Science.</td>
<td>Recently, most students admitted have had averages of 80% or higher. Applicants with lower averages may be considered on the basis of other indicators, including information provided on the Arts 'Admission Information Form'. Applicants not admitted to Arts Applied Studies (Co-op) will be considered for the Arts Regular program.</td>
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<tr>
<td>(Co-op)</td>
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<td>OUAC Code: WQ</td>
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<tr>
<td>Engineering</td>
<td>Six Ontario Academic Courses including:</td>
<td>Applicants are encouraged to take the OAC in Finite Mathematics although it is not an admission requirement; also, it is recommended that applicants include one or two Computer Science courses in their secondary school background.</td>
<td>The majority of admitted students have averages of 75% or higher. A number of applicants with lower averages are admitted on the basis of additional factors such as evidence of a strong aptitude and interest in Engineering, extensive involvement in extra-curricular activities, additional background beyond the minimum six OAC courses, and performance on the Descartes Mathematics Contest. Applicants with high averages who are missing any of the required courses must contact the Director of Admissions for Engineering no later than December (for admission the following September) for advice on the course of action required to meet the admission requirements.</td>
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<tr>
<td>OUAC codes for Engineering (Co-op)</td>
<td>Algebra and Calculus</td>
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<td>Civil - WE</td>
<td>Geometry</td>
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<td>Computer - WWJ</td>
<td>Physics</td>
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<td>Electrical - WWF</td>
<td>Chemistry</td>
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<td>Geological - WWG</td>
<td>English 1</td>
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<tr>
<td>Mechanical - WWH</td>
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<td>Systems Design - WD</td>
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<tr>
<td>Environmental Studies</td>
<td>Six Ontario Academic Courses including:</td>
<td>Applicants are encouraged to include Finite Mathematics in their program; as well, independent art studies, secondary school art programs or other creative fields of study are strongly recommended.</td>
<td>Applicants with an average of 75% or higher are given first consideration. Selected applicants are normally required to come to the University for an interview as part of the admission process. Selection for the interview is based on secondary school records including university-entrance courses. Admission is based on the results of the interview, the applicant's portfolio, an English precise-writing exercise and secondary school achievement.</td>
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<tr>
<td>Architecture</td>
<td>English or Français</td>
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<tr>
<td>(pre-professional program)</td>
<td>Physics</td>
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<tr>
<td>OUAC Code: WR</td>
<td>Calculus</td>
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<tr>
<td></td>
<td>Algebra and Geometry</td>
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<tr>
<td>Environmental Studies</td>
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<tr>
<td>Environment and Resource Studies</td>
<td>Six Ontario Academic Courses including English</td>
<td>Applicants are encouraged to include OAC Science and Mathematics in their program.</td>
<td>Applicants with an average of 70% or higher are given first consideration. It is important that applicants complete the 'Personal Information Form' sent to them with the acknowledgement of their application.</td>
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<tr>
<td>OUAC Code: WER</td>
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<tr>
<td>Geography</td>
<td>Six Ontario Academic courses including English</td>
<td>Applicants are encouraged to include an OAC Mathematics in their program.</td>
<td>Applicants with an average of 70% or higher are given first consideration.</td>
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</table>
## Admissions

### Specific Admission Requirements and Recommendations

<table>
<thead>
<tr>
<th>Faculty/Program</th>
<th>Requirements</th>
<th>Recommendations</th>
<th>Comments</th>
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<tbody>
<tr>
<td><strong>Urban and Regional Planning</strong></td>
<td>Six Ontario Academic Courses including English.</td>
<td>Applicants are encouraged to include an OAC Mathematics in their program.</td>
<td>Applicants with an average of 70% or higher are given first consideration. Selected applicants are normally required to come to the University for an interview as part of the admission process. Selection for the interview is based on the secondary school record including Ontario Academic Courses. Admission is based on the results of the interview, letters of reference, a 'Personal Information Form', and secondary school achievement.</td>
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<td>OUAC Code: WP</td>
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<td><strong>Independent Studies</strong></td>
<td>Applicants should be capable of doing university-level work, should be strongly motivated to work on their own, and should be planning studies that can be done at the University of Waterloo.</td>
<td>Admission is determined by an Admissions Committee which interviews applicants.</td>
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<tr>
<td>OUAC Code: WI</td>
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<tr>
<td><strong>Mathematics</strong></td>
<td>Six Ontario Academic Courses including:</td>
<td>Applicants are encouraged to develop as much breadth as possible by choosing courses from the arts, humanities, social sciences and physical sciences. It is recommended that applicants considering a mathematics and accounting program include at least one Accounting course as part of their secondary school program. Although Finite Mathematics is not a specific requirement, and lack of it will not adversely affect consideration for admission, it is strongly recommended that applicants include this course in their selection. A consequence of planning course selection to incorporate the above advice may be that applicants exceed the minimum number of courses required for admission.</td>
<td>The majority of admitted students have averages of 75% or higher. The Admissions Committee gives close attention to evidence indicating an exceptional aptitude and interest in mathematics, teachers' recommendations, performance in the Descartes Mathematics Contest, the number and variety of OAC credits and involvement in extracurricular activities. Students not offered admission to the program of their choice are considered for all other Mathematics programs. Students wishing to pursue a program which combines Accounting and Computer Science should apply to the WN (Mathematics-Accounting Options Co-op) category.</td>
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<tr>
<td>OUAC Codes:</td>
<td>Algebra and Geometry Calculus English</td>
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<tr>
<td><strong>Accounting Options</strong></td>
<td>English</td>
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<tr>
<td>(Co-op including Computer Science) - WN</td>
<td>with a minimum grade of 60% in each of the required courses.</td>
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<td><strong>Co-op Applied Computer Science</strong> - WT</td>
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<td><strong>Honours Regular Science - WS</strong></td>
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<td><strong>Optometry (Years 1-4)</strong></td>
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<tr>
<td><strong>WB (Application is made after completion of Year One Science)</strong></td>
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<tr>
<td><strong>Science</strong></td>
<td>Six Ontario Academic Courses including:</td>
<td>Applicants should include both Chemistry and Physics if they are applying to any Science program. A course requiring writing skills would be an asset. For co-operative Applied Chemistry and Physics both Finite Mathematics and Algebra and Geometry are recommended. For the Geophysics Option within co-operative Applied Earth Sciences, Algebra and Geometry are recommended.</td>
<td>The most recent minimum average of successful applicants to Regular Honours Science has been in the mid 60's, and to all Co-operative programs, low 70's. Minimum marks required for the following Co-operative programs are: Biochemistry and Applied Chemistry – 70% in Chemistry and 70% in Mathematics. Applied Physics – 75% overall in Physics and Mathematics with at least 70% in each of Physics and Calculus. Students not admitted to the program of their choice are automatically considered for other programs in Science or which they qualify.</td>
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<tr>
<td>OUAC Codes:</td>
<td>Algebra and Geometry Calculus English</td>
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<tr>
<td><strong>Co-op Biochemistry - WYW</strong></td>
<td>English</td>
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<td><strong>Co-op Biology - WU</strong></td>
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<td><strong>Co-op Chemistry - WH</strong></td>
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<tr>
<td><strong>Co-op Applied Earth Sciences</strong></td>
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<tr>
<td><strong>Co-operative Physics - WY</strong></td>
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<tr>
<td><strong>Honours Regular Science - WS</strong></td>
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<tr>
<td><strong>Optometry (Years 1-4)</strong></td>
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<tr>
<td><strong>WB (Application is made after completion of Year One Science)</strong></td>
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</table>
Application Procedures

1. Applicants who wish to pursue degree studies on a full-time basis must submit their applications through the Ontario Universities' Application Centre (OUAC):
   a) Applicants presently enrolled in an Ontario Secondary School as a full-time day student must complete OUAC Form 101 available from the secondary school guidance departments.
   b) All other applicants must complete OUAC Form 105. These forms may be obtained from the Registrar's Office.

2. a) Applicants who wish to pursue degree studies on a part-time basis or non-degree or post-degree studies should contact the Registrar's Office for the appropriate application forms.
   b) Applicants who wish to take courses by correspondence should write to the Correspondence Program, University of Waterloo, Waterloo, Ontario N2L 3G1 or call (519) 888-4050.

When requesting an application form from the University, candidates should outline their academic background and indicate the exact program and level of admission they are seeking. This will help to determine the appropriate application form as well as enable us to send additional information which an applicant may find helpful.

Further instructions on application procedures and documents required will be sent with the application form.

3. Application Dates
   Because of the number of applications received each year, the University has established certain dates after which consideration of an application cannot be guaranteed.

<table>
<thead>
<tr>
<th>Term starting</th>
<th>Last date for application</th>
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<tbody>
<tr>
<td>May 1991</td>
<td>March 1, 1991</td>
</tr>
<tr>
<td>July 1991</td>
<td>June 1, 1991</td>
</tr>
<tr>
<td>*September 1991</td>
<td>July 1, 1991</td>
</tr>
<tr>
<td>January 1992</td>
<td>November 1, 1991</td>
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</tbody>
</table>

Correspondence Program

Students not previously registered at UW
Fall Term
   June 3, 1991
Winter Term
   September 16, 1991
Spring Term
   January 27, 1992

Students previously registered at UW
Fall Term
   June 28, 1991
Winter Term
   October 11, 1991
Spring Term
   February 14, 1992

*Applications and all supporting documentation must be received no later than May 1, 1991 for all Year One limited-enrolment programs, with the following exceptions:

Admissions
Application Procedures
Processing Applications

1. Architecture requires that applications must be dated as received at the OUAC no later than March 15. Supporting documents for Architecture and Urban and Regional Planning must be received at the University no later than April 1.

2. Optometry requires that applications must be dated as received at the University of Waterloo no later than February 28.

Normally no application will be accepted after the first day of lectures in any specific session/term.

Processing Applications

Only complete files containing all required documents (transcripts, letters of reference, etc.) will be presented to the Admissions Committee for consideration.

All Ontario Secondary School applicants will be notified on or after June 14, 1991 of the status of their application for admission. Ontario Secondary School applicants who do not receive an offer of admission at this time will have their applications deferred until the final marks are received by the University. When these marks have been received, qualified applicants will be admitted until the remaining places are filled. Ontario Secondary School applicants who complete their studies in the Fall semester will be considered when final grades are received.

Ontario Secondary School applicants who receive an early offer of admission on June 14, 1991 are encouraged to confirm as soon as possible, but are not required to respond before June 28, 1991.

Applicants who are not currently enrolled in an Ontario Secondary School program can expect to wait several weeks before receiving a decision on their application after all required documentation has been received. Some programs require applicants to come to the University for an admission interview and a decision cannot be made in such programs until after the interview has been accomplished and the Admissions Committee has had ample opportunity to consider all of the information that has been presented to it. Applicants who feel there has been an undue delay in the consideration of their application should check to ensure that all required documents have been received by the appropriate Faculty area in the Registrar's Office.

Release of Academic Information

The University may, on request from a Secondary School in Ontario, release certain academic data regarding performance about the student. The data will be released only if the student has authorized the release on the application form (OUAC Form 101). Students not wishing to have this information released may indicate their wishes on the application form.
Registration and Fees

Following admission, students will be required to preregister for courses and then make final arrangement for registration. See Chapter 3 for an explanation of these procedures.
Fees and Registration
Preregistration, Registration, Fees

PREREGISTRATION
Once admitted to the University, students are advised to preregister for their courses well in advance of the beginning of lectures. Preregistration is the process of choosing courses, having them approved by the appropriate advisor and recorded with the Registrar's Office before the start of classes. First-year students should preregister for courses and programs in consultation with an advisor in their faculty's Undergraduate Office; advanced-year students should select their courses on the advice of the Undergraduate Advisor for their major department. Students registering through Renison College or St. Jerome's College should select their courses with the appropriate advisor at their college. All students must preregister for courses as follows:

1. Newly Admitted Students:
   As soon as possible after academic admission. Information regarding preregistration is forwarded when the student is admitted.

2. Returning Students:
   a) Co-operative Programs
      During the preceding on-campus term.
   b) Regular Programs
      During March of the preceding academic year.

The above action will produce the "Student Schedule and Fee Statement" which will be mailed to the student prior to the start of classes.

REGISTRATION
Students are encouraged, where possible, to preregister and pay their fees by mail (send a cheque or money order payable to the institution of intended registration, i.e., University of Waterloo, Renison College, or St. Jerome's College). For those students who do not register by mail, a registration period is held on campus immediately prior to the beginning of lectures each term.

Registration is completed when fees have been paid or arranged, the "Fee Statement" has been receipted by Financial Services, and any course changes have been approved and successfully processed.

The University reserves the right to require a student to withdraw from a course or courses for academic or other reasons.

ASSESSMENT
Fees are assessed as follows: (Foreign Students – see Note 5 on page 3:6).

1. Co-operative Programs:
   All Terms
   a) Engineering and Architecture
      Students are assessed on a per term basis for the Total Tuition and Incidental Fees shown on the Schedule of Fees. Students taking one or two term courses only in a term are assessed by course at the Unit Course Fee shown.
   b) Other Co-operative Programs
      Students are assessed by course at the Unit Course Fee shown to a maximum of the Basic Fee. Students taking more than two term courses in a term are also assessed Co-operative and Incidental Fees.

2. Regular Programs:
   a) All Terms
      i) Architecture Year One, Independent Studies and Optometry
         Students are assessed on a per term basis for the Total Tuition and Incidental Fees shown on the Schedule of Fees.
      ii) Other Regular Programs
         Students are assessed by course at the Unit Course Fee shown to a maximum of the Basic Fee. Students taking more than two term courses are also assessed Incidental Fees.
   b) Summer Session (July-August)
      Students are assessed by course at the Unit Course Fee shown.

PAYMENT
1. Timing and Amounts Due
   All fees are due and payable by the end of the registration period. See pages 8 to 11 for appropriate dates. Students must pay or arrange fees by these dates, whether or not a final class schedule has been received.
   For Total Tuition Fees and Unit Course Fee see Schedule of Fees.

2. Methods
   a) By Mail
      The University encourages students to register by mail. Detailed instructions outlining the payment procedure will be included with the Fee Statement.
   b) In Person
      For students who cannot register by mail, a registration period is held on campus at the beginning of each term. See pages 8 to 11 for dates.

3. General Information
   a) Fees should be paid with cash, money order or cheque payable to the "University of Waterloo".
   b) Fee payments by scholarships or bursaries not administered by the University or by methods other than those outlined must be authorized in writing by Student Accounts, Financial Services.
   c) Students who have received a "Notice of Assessment" under the Ontario Student Assistance Program (OSAP) may arrange payment of fees using this source of funds. Apply for OSAP early (allow 60 days processing time). OSAP funds not received by the start of term cannot be used as a means to register.
The University will accept post-dated cheques as an arrangement for the payment of fees. Post-dated cheques can be dated up to the Friday immediately prior to registration.

Term | First Day of Registration
----|------------------------
May 1991 | May 1, 1991
September 1991 | September 3, 1991
January 1992 | January 6, 1992
May 1992 | May 4, 1992

Students who are not able to pay or arrange fees as shown above must visit the "Fees Arranged" section of Financial Services during the on-campus registration period to discuss fee arrangements.

Tuition Assistance for Senior Citizens: Effective May 1, 1989 all students 65 years and over who register for degree credit courses will receive a bursary equivalent to the cost of tuition. This bursary will be awarded at the time of registration. Students will be responsible for all other fees connected with their course or registration.

Students whose cheques are returned by the bank for any reason will be assessed a handling charge of $15.00 plus late registration penalty as applicable.

Students who fail to fulfill fee payment arrangements will be assessed a 5% surcharge on the total fees outstanding plus 1½% per month service charge applied to the balance outstanding and calculated from the due date.

Failure to pay all outstanding fees, accounts or other assessments such as library fines before the conclusion of lectures may bar a student from writing examinations and will result in withholding of credit and transcripts for previous work.

It is the student's responsibility to ensure that funds are available at registration; late fees will not be waived for students who have failed to make timely transfer arrangements.

LATE REGISTRATION

Students who register late will be assessed a late fee penalty as follows:

First Day: $10.00
Thereafter: $3.00 per day
(No Limit)

See pages 8 to 11 for dates when late fees start. Students will not be allowed to register after the dates shown below.

Term Starting | Last Date to Register
--------------|----------------------
May 1991 | June 28, 1991
September 1991 | October 31, 1991
January 1992 | January 31, 1992
May 1992 | June 30, 1992

WITHDRAWALS

(Individual Faculty sections should be consulted for academic penalties for late withdrawal.)

A student who finds it necessary to withdraw from attendance is required to obtain a "Notice of Withdrawal" from the Registrar. This Notice, when signed by both the Dean and the Registrar, or their delegates, may entitle the student to a refund of tuition fees calculated as follows:

1. Students withdrawing before the start of classes will receive a full refund.
2. Students withdrawing in the first three weeks of a term (first week for Summer Session) will receive a full refund less a $25 registration charge. Part-time students will be charged $10.
3. Students withdrawing during weeks four to seven of a term (second week of Summer Session) will receive a refund of 50%.
4. Refunds are not provided to students after week seven of a term (week two of Summer Session).

The specific withdrawal dates are included in the registration information package sent to students each term.

5. Requests for refunds of refundable incidental fees must be addressed to the organization concerned. Such refunds are available for only three weeks, after the start of classes.

6. The Intercollegiate Athletic Fee, the Co-op Fee, and the Internship Fee are refundable upon withdrawal on the same basis as tuition fees.

7. The Health Insurance Fee is refundable on a pro rata basis and the benefits associated with it will be cancelled. The Health Insurance card must be returned at the time of withdrawal.

8. The Federation Hall Fee is not refundable.

9. Certain scholarships and bursaries are given on the condition of completion of the term involved. Any withdrawal refunds will be credited to the agency as required.
10. Students who voluntarily withdraw from their studies will have this noted on their transcript, along with the effective date of withdrawal. This practice does not apply to those students who voluntarily withdraw prior to, and during, the full refund period.

DROP/ADDS
For students assessed on the per course basis, net drop/add activity may change the fee assessment. In general, a net add is assessed at the full rate while a net drop is assessed on the same basis as a withdrawal. It is the student's responsibility to ensure the necessary payment for added courses is made promptly. Failure to do so will result in penalty charges being assessed. Refunds for dropped courses are mailed after week seven of a term (week two of Summer Session).

SCHEDULE OF FEES
The Board of Governors reserves the right to make changes in the published schedule of fees without notice. The University does not undertake or accept responsibility to notify all recipients of this Calendar of fee changes made subsequent to printing deadlines.
Fees and Registration
Schedule of Fees

SCHEDULE OF FEES

Undergraduate Programs – Tuition and Incidental Fees for All Years – Canadian Citizens and Permanent Residents

These are the fees in effect for the 1990-91 academic year. The fees for the 1991-92 academic year, beginning May 1, 1991, have not been determined at the time of printing. A schedule of fees approved by the Board of Governors will be included with student registration information.

Foreign students on Student Authorizations should refer to page 3:6 for fee information.

<table>
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<tr>
<th>Faculty</th>
<th>Basic Term Fee (Note 1, 3) $</th>
<th>Co-op Fee (Note 2) $</th>
<th>Total Tuition Fees $</th>
<th>Total Incidental Fees $</th>
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* The total fee for the Professionally Accredited Stream (PAS) of this program includes the required Internship Fee of $180.00 per term.

† Includes $11.00 work report marking fee (see Note 3).
FEES FOR FOREIGN STUDENTS WITH STUDENT AUTHORIZATIONS (see also Note 5)
These are the fees in effect for the 1990-91 academic year. The fees for the 1991-92 academic year, beginning May 1, 1991, have not been determined at the time of printing. A schedule of fees approved by the Board of Governors will be included with student registration information.

For an undergraduate student on Student Authorization:

1. Registration in an undergraduate program in Architecture, Engineering, or Optometry:
   Basic tuition fees are $5036.00 per term plus incidental fees as shown below. The Unit Course Fee is $1007.00 per term course.
   
2. Registration in any other undergraduate program:
   Basic tuition fees are $3090.00 per term plus incidental fees as shown below. The Unit Course Fee is $618.00 per term course.

* Registration in Co-operative programs is available only to students who are Canadian Citizens or Permanent Residents.

INCIDENTIAL FEES

1. The following incidental fees are compulsory:
   - Interuniversity Athletics
   - Health Insurance (see Note 6)
     - Regular: $23.04
     - Co-op: $43.20
   - Federation Hall (see Note 7): $7.50

2. The following incidental fees must be paid on registration but are refundable on request from the organization listed below within three (3) weeks after the start of lectures for the term:
   - Federation of Students (see Note 8): $22.25
   - Student Society (see Note 9):
     - Applied Health Sciences: $3.00
     - Architecture: $5.00
     - Arts: $7.00
     - Engineering: $10.50
     - Environmental Studies: $5.00
     - Independent Studies:
     - Mathematics: $5.00
     - Optometry: $6.00
     - Science: $6.00
     - Voluntary Student Contribution (Accounting and Engineering): $75.00

3. The following incidental fees are voluntary, not a requirement of registration and are refundable on request from the organization listed below within three (3) weeks after the start of lectures for the term:
   - WPIRG (see Note 10): $3.28
   - Sandford Fleming Foundation (see Note 11): $3.00
   - Radio Waterloo (see Note 12): $4.00
   - Imprint (see Note 13): $3.65
   - Science Foundation (see Note 14): $3.00

Fees and Registration
Schedule of Fees

Note 1 – Term
Term refers to a particular four-month period of registration: Fall Term – September to December; Winter Term – January to April; Spring Term – May to August.

Note 2 – Co-operative Fee
Additional fee assessed to all Co-operative program students registered in more than two term course equivalents per term.
In offering Co-operative programs, the University incurs significant extraordinary costs in the academic departments, as well as in the Department of Co-operative Education and Career Services, the Registrar’s Office, and other departments which serve the students. These costs are not provided for in the operating grants received from the Government. The University recovers a portion of the extra costs of Co-operative programs by collecting a special Co-op service fee from students registering in these programs. The Co-op fee is set in accordance with the methodology approved by the Ministry of Colleges and Universities and distributes the cost recovery over all terms of the Co-operative programs in which students pay fees.

Note 3 – Tuition Rates for Co-op Students
Tuition for Co-op students is set at a rate of $11.00 per term higher than the corresponding rate for non-Co-op students. This additional fee will recover the academic-related costs of marking work reports and is calculated in accordance with guidelines approved by the Ministry of Colleges and Universities.

Note 4 – Unit Course Fee
The fee assessed at $184.00 for each term course at a weight of 0.5, and at a prorated value for other course weights. The Unit Course Fee for Foreign Students with Student Authorization is shown above.

Note 5 – Student Authorizations
The Ontario Government has established a policy of higher tuition fees for foreign students studying in Ontario on Student Authorizations. The policy came into effect as of January 1, 1977. The higher fees apply to all students beginning a program on or after January 1, 1977, except for those who qualify for exemption under one of the following categories.

1. A citizen of Canada within the meaning of the Citizenship Act or a person registered as an Indian within the meaning of the Indian Act;
2. A Permanent Resident within the meaning of the Immigration Act, 1976;
3. A visitor admitted to and remaining in Canada under clause 10(c) of the Immigration Act, 1976 who has entered Canada or is in Canada to carry out his/her official duties as a diplomatic or consular officer or representative or official properly accredited of a country other than Canada, or of the United Nations or any of its agencies or of any intergovernmental
organizations in which Canada participates or as a dependent member of the staff of any such diplomat, consular officer, representative or official; or a member of a foreign military force or of a civilian component thereof admitted to Canada under the Visiting Forces Act, and any dependents of such personnel;

4. A dependent* of a visitor who is admitted to and remaining in Canada under clause 10(c) of the Immigration Act, 1976 for the purpose of engaging in employment;

5. A person admitted to and remaining in Canada who is officially recognized by the Employment and Immigration Commission of Canada as a Convention refugee within the meaning of the Immigration Act, 1976;

6. A person admitted to and remaining in Canada under clauses 10(a) and 10(b) of the Immigration Act, 1976 who is sponsored and financially assisted by one of the following: the Canadian International Development Agency, the International Development Research Centre, the World Bank, and any program of financial assistance to students under an aid program of the United Nations or its agencies provided such a program is recognized and directly or indirectly assisted by the Government of Canada;

7. A person admitted to and remaining in Canada under clause 10(a) or 10(b) of the Immigration Act, 1976, who is sponsored by a foundation: which is a recognized international charitable foundation; and which is registered as a charitable organization either in Canada or another industrialized country; and whose particular aid program is international in scope and aimed at low-income developing countries; and which provides full support to the student including travel, living expenses, tuition fees, etc.; and where prior approval of the Minister has been secured;

8. A person admitted to and remaining in Canada under clause 10(a) or 10(b) of the Immigration Act, 1976 who is the holder of an Ontario graduate Scholarship.

* In clause 4, “dependent” means the spouse of that person and any unmarried son or daughter of that person or of the spouse of that person who is in full-time attendance at an Ontario university or related institution.

The foregoing is a condensed version of the “Foreign Student Fee Differentials and Exemptions.” For further details, contact the Office of the Registrar.

Note 6 – Health Insurance
Effective September 1, 1978, a revised supplementary Student Health Insurance Plan was put into effect at the request of the student body. Student premiums are shown in the Schedule of Fees. The premium and coverage may be waived if proof of equivalent or better insurance coverage is provided. Exemption Forms are available in the Cashier’s Office, Needles Hall. Dependent (family) coverage may be obtained on request and by payment of a further $31.30 for a Regular student per term and $58.69 for a Co-operative student at each registration.

This plan does not include the benefits of the Ontario Health Coverage. It is the student’s own responsibility to ensure that such personal coverage is obtained.

Further details are available from Health Services.

Note 7 – Federation Hall
This non-refundable fee being assessed starting Fall term 1984 was approved by student referendum in 1983.

Note 8 – Federation of Students
Payment of the Federation of Students fee is required at registration, but a student who does not wish to participate may obtain a refund by applying to the Federation of Students within three (3) weeks after the start of lectures as indicated on pages 8 to 11 of this Calendar.

Note 9 – Society Fees
Payment of the Society Fee is required at registration, but a student who does not wish to participate may obtain a refund by applying to the respective society within three (3) weeks after the start of lectures as indicated on pages 8 to 11 of this Calendar.

Note 10 – WPIRG (Waterloo Public Interest Research Group)
A student funded environmental and social research group.

This fee is voluntary, refundable, and not a requirement for registration. Requests for refunds or questions concerning WPIRG should be directed to the on-campus WPIRG office within three (3) weeks after the start of lectures as indicated on pages 8 to 11 of this Calendar.

Note 11 – Sandford Fleming Foundation (S.F.F.)
An organization dedicated to the development of co-operative engineering education.

This fee applies to Engineering students only and is voluntary, refundable and not a requirement for registration. Requests for refunds should be directed to the on-campus Engineering Society office, within three (3) weeks after the start of lectures for the term as indicated on pages 8 to 11 of this Calendar.

Note 12 – Radio Waterloo
The on-campus student radio station.

This fee is voluntary, refundable, and not a requirement for registration. Requests for refunds should be directed to the Radio Waterloo office within three (3) weeks after the start of lectures for the term involved as indicated on pages 8 to 11 of this Calendar.

Note 13 – Imprint
The student newspaper.

This fee is voluntary, refundable and not a requirement for registration. Requests for refunds should be directed to the Imprint office within three (3) weeks after the start of lectures for the term involved as indicated on pages 8 to 11 of this Calendar.
Note 14 - Faculty of Science Foundation Fee
This fee applies to Science students including Optometry and is voluntary, refundable and not a requirement for registration. Requests for refunds should be directed to the Faculty of Science Foundation, within three (3) weeks after the start of lectures for the term as indicated on pages 2 to 11 of this Calendar.

Note 15 - Other Costs
The fees shown do not include the costs of text books, class notes, Correspondence Program tape or kit deposits, mandatory supplies, certain accommodation or other costs associated with field trips, or other miscellaneous expenses, some of which are noted below:

Miscellaneous Fees
Re-examination fee (Engineering only) $50.00
Returned Cheques – handling charge (plus late registration penalty as applicable) $15.00
Duplicate Tax Receipt $ 5.00
Letter of Verification of Registration $ 5.00
Replacement of lost or stolen student
  Photo Identification Card $20.00
Replacement of lost or stolen student
  Health Insurance Card $ 5.00
Transcript of Record
  $5.00 for first copy
  $3.00 for each additional copy ordered at the same time as the first copy
Letter of Permission $25.00
To Whom It May Concern Letters
  $3.50 for each copy

RESIDENCE
Residence fees are payable by term and are due in full on or before the day of residence registration. Students who have received a Notice of Assistance under any awards program may apply to residence fees only those funds which are received during the term in question.

INCOME TAX RECEIPTS
• Receipts for income tax purposes for fees paid covering the calendar year 1991 will be available after March 1, 1992.
• Receipts to part-time students and Co-operative program students on work term will be mailed to the home address on record.
• Receipts to on-campus students will be available for pick-up at specified location(s) on campus. (Notification of pick-up location(s) will be published in the University of Waterloo Gazette, prior to March 1, 1992.)
Awards and Financial Aid

One of UW's 230 1990 Canada Scholars receives her award at a reception sponsored by the Government of Canada.
Awards and Financial Aid

The Student Awards Office is responsible for the administration of all forms of financial assistance for undergraduate students. This includes the Ontario Student Assistance Program (OSAP) and other forms of government aid to students. As well, the Office administers the University's Undergraduate Scholarship and Bursary Program and an Emergency Loan Fund.

Students requiring information regarding the awards listed below or any other information regarding financial aid are invited to contact the Student Awards Office, Needles Hall, University of Waterloo.

Unless otherwise stated, no application is required for the awards listed below.

Definitions

The term "Award" is a general designation applied to any scholarship, prize, medal, fellowship or grant of money assigned to a student. Within this designation, awards are further defined as follows:

Scholarship: A monetary award, based solely on outstanding overall academic performance or excellence in a specific subject or group of subjects.

Prizes and Medals: A monetary award of small value or a non-monetary award (e.g., book prize or medal) given in recognition of academic performance or excellence in the area to which the award pertains.

Work-Term Report Award: A monetary award based on writing skills demonstrated in work-term reports.

Bursary: A monetary grant based primarily on financial need.

Regulations Governing University of Waterloo Undergraduate Awards

1. Unless otherwise stated in the terms of reference of the awards, eligibility for entrance and upper year awards is normally restricted to students who register for a full course load (minimum five half-credits per term).

2. Awards with a monetary value are normally paid during terms when the recipient is registered as a full-time student.

3. The first charge against any award payment will be for tuition and fees.

4. Awards valued at more than one-term tuition will normally be paid in two term instalments.

5. A student may not hold more than one major University of Waterloo award in one academic year. (A major award is defined as having a value equal to one-term full-time tuition at the University of Waterloo.)

Regulations Governing University of Waterloo Undergraduate Awards

6. If a student withdraws or otherwise fails to complete the term(s) covered by an award, the award will be pro-rated.

7. If no qualified applicant is found for a particular award in any year, the University reserves the right to withhold the award.

8. Awards based on donations from outside sources cannot be guaranteed by the University and can be forwarded only after the funds have been received from the donor.

University of Waterloo Entrance Awards

The University administers a substantial number of entrance awards to entering students. With the exception of special awards for students from Waterloo County secondary schools, these awards are presented by the faculty to which the student is seeking admission.

In addition to secondary school achievement, performance on the various UW special competitions are important considerations in administering entrance scholarships in Chemistry, Engineering, Mathematics and Physics as follows:

Chemistry
Students must write the CHEM 13 NEWS Competition.

Mathematics
Students must write the Descartes Mathematics Competition.

Physics
Students must write the Sir Isaac Newton Physics Competition.

Engineering
Students must write the Descartes Mathematics Competition.

Note
An application for admission to the University will suffice as an application for any entrance award for which the student is eligible.

FACULTY OF APPLIED HEALTH SCIENCES AWARDS

Awards are available in varying amounts for one year. All students with an Ontario Secondary School average of 80% or better are considered.

FACULTY OF ARTS AWARDS

The Faculty of Arts is offering several entrance scholarships in recognition of academic excellence. Entrance scholarships are awarded on the basis of secondary school performance and include a four-year $5,000 award and numerous Arts Scholar Awards valued at $100.
Federal-Provincial Conference Simulation Entrance Award
One award valued at $100 is given annually by the Political Science Department to a student entering the first year of full-time studies at the University of Waterloo and who has been a participant in the annual Federal-Provincial Conference Simulation sponsored by the Department and the History Heads Council of the Waterloo County Board of Education.

Catherine E.B. Hanna Accounting Entrance Scholarship
The Catherine E.B. Hanna Accounting Entrance Scholarship valued at $1,000 is named in recognition of Mrs. Hanna’s support of, and interest in, accounting education. The award is made annually to a student entering an Accounting Program in the Faculty of Arts at the first-year level. In addition to overall academic excellence the student will have attained high levels of success in humanities subjects at the high school level.

RJR MacDonald Accounting Entrance Scholarship
This scholarship, valued at $4,000 over four years is awarded annually to an outstanding student entering the first year of the Honours Accountancy Studies program in the Faculty of Arts. Continuance of the award beyond Year One is dependent on the student maintaining an A average, to a possible total value of $5,000, is given to the most outstanding student entering the Faculty of Arts.

J. Sayer Minas Entrance Scholarship
The award, valued at $2,000 in the first year and renewable at $1,000 for three years if the student maintains an A average, to a possible total value of $5,000, is given to the most outstanding student entering first year in the Faculty of Arts.

Friar Luca Paciolo Fellowships
Two awards, with a total possible value of $5,000 each are awarded annually to Year One applicants to Accounting programs in either the Faculty of Arts or the Faculty of Mathematics. One thousand dollars is allocated in first and second year and $1,500 is allocated in third and fourth year, if the student maintains a B+ average in accounting-related subjects. Applicants must complete the Faculty of Arts Admission Information Form. Selection of the fellows is based on academic merit and extra-curricular activities.

Mary Rosenthal Entrance Scholarship
One scholarship, valued at $400 is presented to a top student from Wellington County entering the Faculty of Arts.

W.J. Schlatter Scholarship
This $500 scholarship is awarded annually to an outstanding high school student entering an Accounting Program in the Faculty of Arts. This scholarship is in honour of Dr. William Schlatter who, during his long career, instilled a search for knowledge and a broad interest in life in students and colleagues, many of whom now teach at Waterloo. The recipient will have demonstrated the breadth of interests beyond accounting that Dr. Schlatter values so highly. The scholarship is awarded on the basis of academic performance and information provided by the applicant on the Arts Admission Information Form.

FACULTY OF ENGINEERING AWARDS
The Faculty of Engineering offers three types of scholarships: (1) a large number of one-term tuition awards; (2) a small number of one-year awards each with a total value of $1,000 to $2,000; (3) one or two awards valued at $2,000 for Year One and renewable for Years Two, Three and Four each having a total value of $4,200. A term average of 80% is required for renewal of entrance scholarships. Scholarships are awarded on the basis of Secondary School average, the results of the Descartes Mathematics Competition, information supplied on the Personal Information Form for Applicants and letters of reference. To be eligible for scholarship consideration, students must write the Descartes Mathematics Competition.

Alfred Armbrust Memorial Scholarship
This scholarship is awarded annually to an outstanding student entering the Faculty of Engineering. It is awarded in conjunction with Engineering Faculty Entrance Scholarships.

Association of Professional Engineers Entrance Award
The Association of Professional Engineers of the Province of Ontario provides a $1,000 entrance award to an outstanding student who is entering an accredited Engineering Program at the University of Waterloo.

Dr. Sidney Blair Scholarship in Geological Engineering
Dr. Sidney Blair was a prominent Canadian geologist who was awarded an honorary degree from the University of Waterloo. Through a donation from his estate, the Alumni Association is offering an entrance scholarship of $1,200 renewable for three years to a total value of $4,800 if the student maintains a term average of 80%. The award is made as funds permit to an outstanding student entering Geological Engineering.

Colonel Hugh Heasley Engineering Scholarships
A number of scholarships in varying amounts are provided for outstanding students in Engineering from an endowment established by the estate of the late Colonel Heasley. For details see University of Waterloo Engineering Faculty Entrance Scholarships.

Hilliker Entrance Award
One award of $500 is given to an outstanding student entering Engineering, Mathematics or Science from Tillsonburg, Ontario. Preference will be given to students entering Engineering.
Awards and Financial Aid
University of Waterloo Entrance Awards

Sullivan Entrance Award
One award of $1,000 is given to an outstanding student entering Engineering, Mathematics or Science from Pauline Johnson Collegiate and Vocational School, Brantford, Ontario. Preference will be given to students entering Engineering.

FACULTY OF ENVIRONMENTAL STUDIES AWARDS
Awards are available in varying amounts for one year. All students with an Ontario Secondary School average of 80% or better are considered.

Geography
Awards are offered on the basis of academic standing only.

Environment and Resource Studies
Awards are offered on the basis of comments on the Supplementary Information Form and academic standing.

Planning
Awards are offered on the basis of comments made on the Personal Information Form and academic standing.

FACULTY OF MATHEMATICS AWARDS
René Descartes Scholarships, Fellowships and Bursaries
The René Descartes Foundation offers 200 annual awards ranging in value from $300 in Year One to $10,000 distributed over four years. One hundred of these have values of $1,000 or greater. All applicants to the Faculty of Mathematics are candidates if they have written the Descartes Mathematics Contest and have submitted the Applicant Supplementary Information Form. Preference is given to those who have made the Faculty of Mathematics their first choice of program.

K.D. Fryer Entrance Scholarship
This award is given in recognition of an incoming first-year student's excellent high school record and a sustained superb performance on the Math contests (including the Descartes Contest) as conducted by the Canadian Math Competition Office of the Faculty of Mathematics. The recipient will also have demonstrated an interest in extracurricular activities, such as student government or sports or a devotion to the development of additional talents in music or the arts. The student will receive a $12,000 scholarship in support of an entire undergraduate Math program at Waterloo.

Hilliiker Entrance Award
One award of $500 is given to any outstanding student entering Engineering, Mathematics or Science from Annandale High School or Glendale High School, Tillsonburg, Ontario. Preference will be given to students entering Engineering.

Friar Luca Paciolo Fellowships
Two awards, with a total possible value of $5,000 each are awarded annually to Year One applicants to Accounting programs in either the Faculty of Arts or the Faculty of Mathematics. One thousand dollars is allocated in first and second year and $1,500 is allocated in third and fourth year, if the student maintains a B+ average in accounting-related subjects. Applicants must complete the Personal Information Form. Selection of the fellows is based on academic merit and extra-curricular activities.

Sullivan Entrance Award
One award of $1,000 is awarded to an outstanding student entering Engineering, Mathematics or Science from Pauline Johnson Collegiate and Vocational School, Brantford, Ontario. Preference will be given to students entering Engineering.

FACULTY OF SCIENCE AWARDS
Biology
Biology offers several awards valued at $1,350 for Year One and renewable for Year Two for a total value of $2,000. Students must maintain an 83% average at the end of Year One for renewal.

Biochemistry
As above, provided by the Departments of Biology and Chemistry.

Helen and Joseph R.P. Charron Optometric Entrance Scholarship
Two scholarships valued at $200 each are awarded to the top female and male student entering the first professional year of Optometry who possess a Bachelor of Science degree and have completed their pre-optometry program at an external university. These awards have been established by Dr. Robert J. Charron in appreciation of his parents' support through his entire educational training.

K.N. Research Assistantships
The Department of Chemistry offers CHEM 13 NEWS Research Assistantships to recognize academic excellence in students proceeding to a degree in Chemistry. The awards are made for one year at a time and are valued at $500 for one year. Award holders are required to work with a professor of his/her research group within the Department. Awards to students entering Year One are made on the basis of performance on the CHEM 13 NEWS Examination competition held in May.

Chemistry Scholarships
Two scholarships valued at $4,000 may be offered for Year One and renewable for Year Two, Three and Four for a possible total of $10,000. Several scholarships valued at $2,000 for Year One and renewable for Year Two, Three and Four for a possible total of $5,000 will also be offered. A year average of 83% is required for renewal of entrance scholarships.
Hilliker Entrance Award
One award of $500 is given to an outstanding student entering Engineering, Mathematics or Science from Annandale High School or Glendale High School, Tillsonburg, Ontario. Preference will be given to students entering Engineering.

Sir Isaac Newton Scholarships
The Department of Physics awards Sir Isaac Newton (SIN) Scholarships to recognize and encourage academic excellence in students proceeding towards an Honours Physics degree. The awards are made mainly on the basis of the SIN Physics Competition, written in secondary schools early in May. The awards are valued at $1,200 for Year One. Satisfactory academic performance leads automatically to SIN Assistantships in upper years. These carry a stipend of $700 and involve a minor academic or research project within the Department. In addition, SIN Assistants may also win upper year SIN Scholarships described later, so the total value could approach $7,000. (These scholarships may be limited by other major concurrent awards held by the recipient.)

Sullivan Entrance Award
One award of $1,000 is awarded to an outstanding student entering Engineering, Mathematics or Science from Pauline Johnson Collegiate and Vocational School, Brantford, Ontario. Preference will be given to students entering Engineering.

UNIVERSITY-WIDE AWARDS
Canadian Merit Scholarship Foundation Award
The Canadian Merit Scholarship Foundation offers several awards each year to outstanding students entering participating universities. The awards are based on academic standing, evidence of moral force of character, capacity to lead and to motivate fellow students, extra-curricular attainments, physical vigor and evidence of a strong commitment to the community, both within and outside the school. Candidates are nominated by participating high schools. Awards are valued at $2,500 and are renewable for up to three years. Successful candidates registering at the University of Waterloo will also receive a University of Waterloo – Canadian Merit Scholarship equivalent to the value of tuition and incidental fees and renewable for up to three years.

Hilliker Entrance Award
One award of $500 is given to an outstanding student entering Engineering, Mathematics or Science from Annandale High School or Glendale High School, Tillsonburg, Ontario. Preference will be given to students entering Engineering.

University of Waterloo Alumni Scholarships
Entrance scholarships with a maximum value of $4,800 of which $1,200 is allocated in the first year and $1,200 may be allocated in each of three additional years, will be awarded from an endowment fund established by Alumni to outstanding students entering each Faculty. The criteria for awarding and renewing these scholarships will be determined by the awarding Faculty.

Waterloo County
University of Waterloo – Waterloo County Entrance Scholarships
One entrance scholarship per school may be awarded to an outstanding student entering the University from a secondary school in the Region of Waterloo. A small number of two-year special entrance scholarships may also be awarded with eligibility for the second year being dependent on the student maintaining an average of 80%.

Ford S. Kumpf Scholarships
Through a bequest of the late Ford S. Kumpf of Waterloo, a number of scholarships are awarded annually to outstanding students entering the University from secondary schools in the Region of Waterloo. The awards are made in conjunction with Waterloo County Entrance Scholarships.

Gladys and Norman Rafter Memorial Scholarships
A number of entrance scholarships are awarded to the top eligible students graduating from secondary school in the Region of Waterloo. The awards are made in conjunction with Waterloo County Entrance Scholarships.

Mr. and Mrs. C.W. Snider Memorial Scholarships
A number of entrance scholarships are awarded to the top eligible female students graduating from secondary school in the Region of Waterloo. They are awarded in conjunction with Waterloo County Entrance Scholarships.

University of Waterloo Upper-Year Awards
FACULTY OF APPLIED HEALTH SCIENCES AWARDS
A limited number of upper-year scholarships in varying amounts are made available each year. Scholarships are based on academic achievement in the previous year.

Lois Matthews Scholarship Program for the Faculty of Applied Health Sciences
These scholarships, valued at $600, are awarded annually to the student with the highest overall cumulative academic average at the completion of Year Two in each of Honours Dance, Honours Health Studies, Honours Kinesiology and Honours Recreation and Leisure Studies. Students with an overall average of 80% or better will be considered.
Awards and Financial Aid
University of Waterloo Upper-Year Awards

INDEPENDENT STUDIES AWARDS
A limited number of upper-year scholarships in varying amounts are made available each year.

FACULTY OF MATHEMATICS AWARDS
René Descartes Scholarships, Fellowships and Bursaries
Upper-year prizes and fellowships in varying amounts are awarded to students in the Faculty of Mathematics based on outstanding performance in the previous year.

E.T. Davies Memorial Prizes
In memory of the late Professor E.T. Davies, his colleagues in the Applied Mathematics Department offer annually two prizes of the approximate value of $150 each. One prize is for a first-year student, enrolled in Applied Mathematics. The other prize is for the third-year Applied Mathematics student who ranks first on the final examinations.

Doris Dixon Award
Each Dixon Award is presented by the Descartes Foundation to a student who, while not receiving a Descartes Entrance Award, demonstrates excellence during his/her program of undergraduate studies. The initial award of $1,000 is accompanied by an offer of a Descartes Fellowship.

Ross Dixon Award
Each Dixon Award is presented by the Descartes Foundation to a student who, while not receiving a Descartes Entrance Award, demonstrates excellence during his/her program of undergraduate studies. The initial award of $1,000 is accompanied by an offer of a Descartes Fellowship.

L. Fejer Award in Mathematics
The scholarship will not exceed $3,200 per annum and may be awarded wholly or in part to one or more graduate students or senior undergraduate students enrolled in the Faculty of Mathematics and proceeding to a degree at the University of Waterloo.

Preference will be given to those whose field of specialization is functional equations and/or information theory. Applications should be made by letter to the René Descartes Foundation, Faculty of Mathematics, University of Waterloo.

K.D. Fryer Gold Medal
The Faculty of Mathematics awards at each Fall Convocation a gold medal to an outstanding member of the graduating class in Mathematics. The recipient will exemplify high academic standing, demonstrate qualities of good student citizenship and be involved in extra-curricular activities. The medal is in honour of Kenneth D. Fryer, a professor of Mathematics since 1959. As Associate Dean of Undergraduate Studies for a number of years, he served the Faculty with academic distinction and good humoured dedication until his death in 1984.
Awards and Financial Aid
University of Waterloo Upper-Year Awards

William Gartrell Award
Dr. William Gartrell, received an Honorary Doctor of Laws degree in 1968 from the University of Waterloo. To commemorate his contributions to education in high school Mathematics, the Faculty has established this award to recognize the scholastic achievements of a second- or third-year student not previously awarded a Descartes Scholarship. The initial award of $1,000 is accompanied by an offer of a Descartes Fellowship.

W.I. Miller Scholarship
The W.I. Miller scholarship, worth $1,500, is awarded annually to a fourth-year student in the Mathematics Co-op Teaching Program who has demonstrated academic excellence and who has also displayed, during co-op teaching terms, the promise of leadership in mathematics teaching. The award is given in memory of Wilfred Isaac Miller, who following a distinguished teaching career in Ontario schools, was an assistant to the Dean and a Lecturer, Department of Combinatorics and Optimization, from 1967 to 1974.

Robert H. Quinn Memorial Prize
Awarded annually to a student in the Business Administration Option of the Faculty of Mathematics who achieves the highest overall average mark at the end of the 3B academic term. This $400 prize is open to Honours students in either the Co-operative or Regular program. Those students completing the 3B term in the Fall or Winter will be judged together, with the award being announced in May. The minimum average which will be considered is 80% or A- standing.

Sprott Endowment Award
An award valued at $500 is made to an exemplary student of the Statistics and Actuarial Science Department. No application necessary.

R.A. Wentzell Memorial Award
An annual award of $150 is awarded to the top male and female students at the completion of second year in an Applied Mathematics program. The award honours the memory of Professor Wentzell, who was a valued member of the Department of Applied Mathematics for over 20 years.

FACULTY OF SCIENCE AWARDS
A limited number of scholarships may be awarded to students in Honours Science.

Chemistry Scholarships
Upper-year scholarships are offered to students on the basis of performance at UW.

CHEM 13 NEWS Research Assistantships
The Department of Chemistry offers CHEM 13 NEWS Research Assistantships to recognize academic excellence in students proceeding to a degree in Chemistry. The awards are made for one year at a time and are valued at $500 for one year. Award holders are required to work with a professor or his/her research group within the Department. Awards to students entering upper years are based on the previous year’s academic performance.

Earth Sciences Scholarships
The Department of Earth Sciences awards a number of scholarships in varying amounts to students in the Earth Sciences Department in each academic year based on academic standing in the previous year. These scholarships may be subject to the condition that no other scholarships are held concurrently.

Optometry Scholarships
The School of Optometry awards scholarships annually to students admitted to the School of Optometry from Regular Science at the University of Waterloo. These awards will be made chiefly on the basis of scholastic achievement and as funds permit in Years One, Two, Three and Four in the School of Optometry.

Sir Isaac Newton Scholarships
SIN Scholarships are awarded annually to the top four students entering each of second, third, and fourth years in Honours Physics, both Regular and Co-op. Values are $750, $600, $450, $300 in each year. (These scholarships may be subject to the condition that no other scholarships are held concurrently.)

The Faculty of Science Foundation
The Foundation sponsors prizes and scholarships for academic and debating achievements by students in Science.

Don E. Brodie Scholarship In Science
This scholarship is awarded to the full-time Science student who earns the highest weighted average in the Fall Term Year One Honours Physics course and laboratory. The award honours the Dean of Science at the time of the creation of the Faculty of Science Foundation.

Don E. Irish Scholarship in Science
This scholarship is awarded to the full-time Science student who earns the highest weighted average in the Fall Term Year One Honours Chemistry course and laboratory. The award honours the Executive Director of the Faculty of Science Foundation during its formative years.

William F. James Sr. Debate Awards
The Faculty of Science Foundation has established the William F. James Sr. Debates competition in order to encourage the art of debate among Science undergraduates. Awards of $100 are made to each member of the winning team and $50 to each member of the runner-up team.
Undergraduate Awards

Where required, applications are available in the Student Awards Office.

Alberta Optometric Association Scholarships
The Alberta Optometric Association presents two scholarships in the amount of $500 to each of two students admitted to the first professional year of the School of Optometry. These are awarded on the basis of academic achievement to students who are residents of Alberta.

Allergan Prize – For Excellence in Anatomy of the Eye and Visual System
A cash award of $500 plus a plaque is presented to a student beginning second year in the Optometry program, on the basis of performance in the first-year anatomy courses.

Allergan Research Scholarship
The Allergan Research Scholarship is awarded to a student entering the third professional year of the Optometry program who has demonstrated academic excellence in Physiological Optics and who wishes to undertake research in this field during the Summer. The candidate for this award will be selected by the Graduate Committee of the School of Optometry.

Anthropology Silver Medal
A silver medal is awarded annually to a third- or fourth-year Anthropology Major or Honours student who has demonstrated academic excellence. No application necessary.

Ambassador of Austria Book Prizes
These prizes are awarded annually to outstanding students in German language and literature.

Ambassador of Switzerland Book Prizes
The prizes are awarded annually to an outstanding student in each of the French, German and Italian programs.

Andersen Consulting Scholarship
One award valued at $1,000 is given to a student entering 4A term in either the Faculty of Engineering or a Co-operative Mathematics Program. Selection of the recipient will be based on academic achievement, active participation/leadership in extra-curricular activities, ability to communicate and career objectives of implementing change through Application Systems Development and/or Manufacturing Process Improvement. Relevant work-term experience will also be considered. Applications should be submitted to the Student Awards Office during the 3B term.

Arts Associate Dean’s Undergraduate Prize
The award is presented to the Faculty of Arts student with the highest overall average in courses taken at the University of Waterloo. The recipient must be in good standing, have completed Year Two and be continuing in a Year Three or Year Four full-time undergraduate degree program.

Arts Student Union Award
One award is offered by the Arts Student Union each term to an undergraduate Arts student who has been actively involved in University student affairs and who has a minimum overall average of 70% or better. Applications should be submitted at the beginning of each term.

Association of Professional Engineers Gold Medal for Academic Achievement Award
The Association of Professional Engineers of the Province of Ontario makes this award to the student in the fourth year of an accredited Engineering program who, having received honours, has obtained the highest standing in the final examinations of the current academic year.

Association of Professional Engineers Undergraduate Scholarship
The Association of Professional Engineers of the Province of Ontario offers four annual scholarships of $500, one to the student in each of the first, second, third and fourth years in an accredited Engineering program who has the highest average in the examinations for that year.

E.F. Attridge Prize
The gift of E.F. Attridge is awarded to the final-year student in the School of Optometry ranking highest in Pathology.

Dr. Howard A. Backman Scholarship
The Dr. Howard A. Backman Scholarship for Physiological Optics is awarded to a student entering the third professional year of the Optometry program who has demonstrated academic excellence in Physiological Optics and who has demonstrated need for support. The Graduate Committee of the School of Optometry will select the candidate for the award from those students applying and who are spending their Summer in research support in Physiological Optics.

Albert Sherwood Barber Medal
A medal is awarded annually to the student graduating with the most outstanding performance in the Co-operative education aspects of the undergraduate Engineering program. The award was established in recognition of the contribution made to the University of Waterloo by Dr. A.S. Barber, the University’s first Director of the Department of Co-ordination and Placement, now the Department of Co-operative Education and Career Services.

The George Barnard Statistics Prize
This prize is awarded once each year to a student completing third-year studies, and who has taken STAT 331, STAT 333, and at least one other third- or fourth-year Statistics course. It goes to the student deemed by the Statistics and Actuarial Science Department to have obtained the best results in these courses. The prize consists of one or more books in probability and statistics.
Barnes-Hind Student Recognition Award
This award for $500 is to be given to a graduating student from the School of Optometry, demonstrating academic and clinical expertise in the area of contact lenses.

Bausch and Lomb, Soflens Division Outstanding Achievement Awards
Total value of these awards is $1,000. These awards are given in recognition of ability and effort in the pursuit and application of knowledge in the contact lens field while a final-year Optometry student.

Bausch and Lomb Soflens O.D. Awards
Two $500 scholarships are awarded to Optometry students who demonstrate need and academic excellence in the preliminary courses related to the contact lens program.

T.T. Beattie Medal
The bequest of T.T. Beattie is awarded to the final-year student in the School of Optometry ranking highest in Orthoptics or Visual Training. The award is made as funds permit.

Jo Beglo Book Prize
An annual award is presented for outstanding work in a designated project in the 2B cultural history course of the Architecture program.

Bell Canada Engineering and Computer Science Awards
The value of these awards is tuition for the final undergraduate year plus an offer of work-term employment with Bell Canada, although acceptance of employment is not a condition of the award. The awards are available to third-year Engineering or Computer Science students who rank in the top half of their class, have an interest in telecommunications or related fields and have been involved in on-campus or community activities. Applications should be submitted during the third year Spring or Fall terms.

The Bvernell Clinical Optometry Award
This award is presented to a graduating student in the Optometry program who demonstrates high achievement and clinical proficiency in Binocular Vision. It consists of a certificate and $300 worth of supplies and equipment provided by the Bernell Corporation.

William J. Beynon Memorial Award For Humanitarian Achievement In Engineering
The William J. Beynon Memorial Awards have been established in recognition of the many humanitarian achievements made both individually and professionally by William(Bill) Beynon. The award, valued at $900, is open to all Engineering students and recognizes actions drawing on or using Engineering knowledge to the benefit of society and humanity in a caring or noble way. Students may apply directly or may be nominated by faculty, students or other interested individuals. A one page summary of actions with supporting documentation should be submitted to the Student Awards Office by August 31st.

J.P. Bickell Foundation, Trustees, National Trust Scholarships
The Trustees of the J.P. Bickell Foundation provide a number of J.P. Bickell Foundation scholarships to be awarded to qualified students in the Chemical Engineering Department and the Earth Sciences Department in any of the second, third or fourth years of the program. To be eligible for one of these scholarships a student must obtain a minimum average of 75% in the previous term's or year's examinations.

Kim Biggar Award
This award is presented to the Faculty of Arts student, entering Year Two of a full-time non-professional program, with the highest overall average in courses taken at the University of Waterloo. The recipient must be in good standing, have completed Year One in Arts at Waterloo and be continuing in Year Two of a full-time undergraduate degree program.

Canadian Association of Geographers Prize
A prize is awarded annually for academic proficiency to a graduating student in a four-year Geography program.

Canadian Contact Lens Society Prize
The proceeds of a fund invested on behalf of the Canadian Contact Lens Society is awarded to a final-year student in the School of Optometry who shows the greatest proficiency in the theoretical and clinical application of contact lenses.

Canadian Hospital Engineering Society's Combined National and Ontario Scholarship
Two awards of $500 each are given to students entering fourth-year Engineering who have an interest in the health care field, have achieved a high level of academic excellence, exhibited leadership qualities and demonstrated an interest in extra-curricular activities. Applications should be submitted during the 3B term.

Canadian Ophthalmic Laboratories' and Suppliers' Prizes
The Canadian Ophthalmic Laboratories and Suppliers provide funds to award the following prizes. Since the amount in the fund varies from year to year, they are awarded in sequence until the fund is exhausted each year.
1. Three General Proficiency Prizes (value $250 each) awarded to the student in the School of Optometry standing highest in General Proficiency in each of the first, second and third years.
2. Three General Proficiency Prizes (value $200 each) awarded to the student in the School of Optometry standing second highest in General Proficiency in each of the first, second and third years.
3. Two awards to final-year students for academic excellence or proficiency in specified subjects.
4. In addition to the above, prizes are awarded for highest academic standing in certain second-, third- and fourth-year subjects as funds allow.
Note:
All of the above prizes are made available through contributions of the following Canadian Suppliers and Laboratories:
- Canadian Optical Supply Co., Montreal, PQ
- Luxottica Canada Inc., Mississauga, ON
- Menrad Canada Inc., Mississauga, ON
- Opal Optical Ltd., Georgetown, ON
- Professional Optical Co., Ltd., Willowdale, ON
- Rodenstock Canada Inc., Toronto, ON

Canadian Posture and Seating Centre Scholarship
Two scholarships valued at approximately $2,500 have been established to recognize and encourage student interest in and attainment of a high level of academic and practical achievement in preparation for development and delivery of systems, methodology or assistive devices in aid of full participation in Canadian Society by physically disadvantaged persons. The scholarships will be awarded to outstanding students who demonstrate an interest and ability in engineering and business directed toward delivery of such services. Interested candidates should apply before September 30th.

Canadian Society for Chemical Engineering Prize
One award, to a Chemical Engineering student, is made annually by the society. The award valued at $50, an engraved medal and a Certificate of Merit, is given to the student with the highest standing in the penultimate year of his/her course.

Canadian Society for Chemistry Prize
One award, to a Chemistry student, is made annually by the society. The award, consisting of an engraved medal and a Certificate of Merit, is given to the student with the highest academic standing in the penultimate year of his/her course.

Canadian Society for Civil Engineering Awards in Building Science
Proceeds from the bi-annual conference on Building Science and Technology are used to provide $3,000 for scholarships to be awarded to Civil Engineering, Mechanical Engineering, or Architecture students at either the undergraduate(3B, 4A or 4B) or graduate level. For consideration, candidates should be academically above average and have an interest in Building Science and Building Technology. Interested students should contact Dr. Eric Burnett in Civil Engineering.

Canadian Society for Mechanical Engineering Gold Medal
The Canadian Society for Mechanical Engineering provides a gold medal and certificate to be presented to a graduating student in recognition of outstanding academic achievement in Mechanical Engineering.

Carousel Dance Centre Entrance Award
The Carousel Dance Centre has an award fund of $1,000 per year which it may allocate to students in amounts ranging in value from $200 to $500. Students who have participated in the full curriculum of Carousel for a minimum of three years and who are enrolled full time in first-year Dance at the University of Waterloo will be considered for the awards by the Directors of the Carousel Dance Centre.

Kaiulani Carr Award
The Kaiulani Carr Award is awarded annually to a senior Recreation and Leisure Studies student in recognition of superior contribution, academically, professionally and personally, to the Department, Faculty and student body. Selection is based on academic standing, other evidence of scholarship, involvement in student life, professional involvement and other personal factors.

Keith Carr Memorial Award
An annual award valued at $600 is awarded to a student in third- or fourth-year Chemical Engineering who has an excellent academic record and has demonstrated strong leadership abilities both at the University and in the outside community. Students should apply in Winter or Spring term each year.

Centennial Optical Scholarships
The Centennial Optical Company offers two scholarships in the amount of $250 to each of two students admitted to the first professional year of the School of Optometry. These awards are made on the basis of academic achievement. Recommendations for these awards are made by the Scholarship Committee of the School of Optometry.

Central Optical Award for Excellence in Special Studies
An award of $500 is given to a final-year Optometry student who has achieved excellence in his/her special study.

Certified General Accountants Association of Ontario Award for Excellence
An annual award of $1,000 composed of a cash award of $150 plus a credit of $850 to be drawn down as and when the successful candidate wishes, for the purpose of defraying any fees related to courses in the CGA study program. The award is made to an outstanding graduating student who has displayed achievement in Accounting. No application necessary.

Chalmers Awards for Bicultural Development
Awards valued at $2,000 are awarded to University of Waterloo Arts Administration students to encourage attendance at a post-secondary Francophone institution in Quebec for one full-time term on a Letter of Permission. To be eligible, students must have completed a minimum of one year of university-level French or equivalent and be in good academic standing following their 2B term. Candidates will be judged on their academic standing, their commitment to the Arts Administration profession and their potential in the field. Awards will be made upon confirmed registration at the Quebec institution. Interested students should apply to the Director of the Arts Administration Specialization.
Chalmers Scholarships for Outstanding Academic Achievement
A limited number of scholarships valued at $1,000 per term are available to Arts Administration students who have completed 2A with a minimum overall average of 80%. Final selection will be based on the candidates commitment to the Arts Administration profession and their potential in the field. A limited number of scholarships are awarded by the Arts Administration Scholarship Committee and may be renewed each term providing the student continues to meet the criteria. No application necessary.

Morgan Champness Memorial Award
Two awards of $75 each are given to fourth-year Mechanical Engineering students who demonstrate outstanding leadership in extra-curricular activities and also have the ability to effectively communicate engineering concepts to their classmates and professors.

Dr. John H. Chapman Memorial Prize in Communications Engineering
A prize of $1,500 has been donated by Spar Aerospace Limited, Toronto, in memory of the late Dr. John H. Chapman whose work and contributions in satellite communications resulted in his becoming known as “the father of the Canadian space program”. The prize is awarded to the third-year student with the highest academic standing in the Electrical Engineering, Communications Option.

Chevron Canada Resources Limited Scholarship
Two awards of $1,000 are awarded to outstanding undergraduate students entering the final year in Engineering. One award of $1,000 will be awarded to an outstanding undergraduate student entering third-year Earth Sciences. Preference will be given to students who have displayed an indicated interest in the field of petroleum. Scholarships are not awarded on the basis of academic excellence alone; other factors such as personality, initiative, community involvement, will also be considered. Applications from Earth Science students should be submitted during the 2B term. Applications from Engineering students should be submitted during the 3B term.

E.J. Chisholm Memorial Scholarship
This $250 scholarship, established in memory of the late E.J. Chisholm, is awarded annually to the third-year student who demonstrates highest academic and clinical proficiency in Pediatric Optometry.

CIBA Vision Care Award
The CIBA collection of Netter's Medical drawings is awarded to a final-year Optometry student for clinical excellence.

Classical Studies Correspondence Prize
A prize of $100 is awarded annually to an outstanding Correspondence student who is majoring in Classical Studies.

Classical Studies Essay Prize
The Classical Studies Essay Prize of $100 is awarded every September to the student who, in the opinion of faculty, has submitted the best essay in any course offered by the Department in the previous

Classical Studies Prize in Greek
A prize of $100 is awarded annually to the student who attains the highest mark in GRK 100B. To qualify for the prize the student must enrol in a further Greek course at the 200-level.

Classical Studies Scholarship For New Majors
A scholarship of $500 is awarded annually to a new major in any on-campus program in the Department of Classical Studies. In addition, there is a $100 scholarship given to a correspondence student of similar excellence.

Classical Studies Senior Scholarship
An award of up to $500 is provided annually to an outstanding upper-year student registered in a Major or Honours program in the Department of Classical Studies.

A.W. Cole Prize
This prize, the gift of the Cole family and donated in honour of their father A.W. Cole, is awarded to the final-year Optometry student ranked highest in Clinical Proficiency.

Auggle Corvino Memorial Award
In memory of the late artist Auggie Corvino, his friends have established an award to be presented annually to a distinguished second-year student of the Fine Arts Program, Studio Option.

Credit Valley Conservation Authority Foundation Scholarship
The Credit Valley Conservation Foundation offers one scholarship valued at $500 annually to an undergraduate student registered in either Geography or Urban and Regional Planning who attains the highest academic standing. Successful candidates' permanent address must be within a member municipality of the Credit Valley Conservation Authority. No application is necessary.

Currie Scholarship
One award is given annually to the upper-year Psychology student in the Faculty of Arts with the highest overall average.

John Deere Limited Scholarship
An award valued at $1,500 is available to an outstanding student entering fourth-year Mechanical Engineering who has an interest in manufacturing and/or product design. Applications should be submitted during the 3B term.

Charles E. DeLew Transportation Scholarship
The DeLew Cather and Company of Canada Limited, in memory of the company's founder, is making an annual award available to a fourth-year Civil Engineering student with the transportation option. The award is in the amount
Awards and Financial Aid

Undergraduate Awards

Samuel Eckler Medal in Actuarial Science
This prize was established to recognize the contribution of Samuel Eckler to the actuarial profession and is provided by Eckler Partners. The medal, which is cast in gold, is awarded each year to the outstanding graduating student of the Honours Actuarial Science Program.

Electrohome 75th Anniversary Scholarship
Established by the Victor Company of Japan Ltd. and Kanematsu-Gosho Ltd. in recognition of the 75th Anniversary of Electrohome Ltd., one scholarship of $2,000 is awarded to an outstanding undergraduate entering the final year of Computer Science. The award will be based on academic performance in several Computer Science courses. Applications should be submitted during the third year or 3B term.

Elgin County Scholarship
Elgin County offers two scholarships of $200 each to the two students from Elgin County attaining the highest academic standing.

Ellis-Don Construction Limited Scholarship
One award of $1,500 is awarded annually to an outstanding undergraduate student entering third year in Civil Engineering. The award will be based on academic performance and work-term performance evaluations.

William Elsdon Thermodynamics Award
The prize is awarded annually to the highest ranking Science student in second-year thermodynamics courses offered by the Chemistry Department. No application is necessary.

Energy + Design Award
Fibreglass Canada and Professor Joe Somfay of the School of Architecture have made available an annual award valued at $300. The award will be presented to an Architecture student who submits the best energy-related design. Students should submit their designs to the Chair of the Awards Committee.

English Language Proficiency Prize
Prizes of $100 each may be awarded to students from Engineering who achieve the highest scores on the English Language Proficiency test.

Essilor Award for Academic and Clinical Excellence in Optics
The Essilor Optical Company presents annually this award of equipment to a final-year Optometry student with excellent academic standing in the areas of Geometrical or Optometrical Optics.

Federation of Chinese Canadian Professionals (Ontario) Education Foundation Scholarship
Two annual awards of $250 each are awarded, one to the student achieving the highest mark in ACC 441 (Accounting Information Systems 1) and one to the student achieving the highest mark in CS 486 (Introduction to Artificial Intelligence).
William Feinbloom Low Vision Award
A Low Vision Trial Set is awarded to the final-year Optometry student who has shown excellence in both the didactic and the clinical aspects of Low Vision care.

Scott Kelsey Frevreau Memorial Award
A $500 award has been established in memory of Scott Kelsey Frevreau, a first-year Mathematics student. The award is to be presented to a second-year Honours Co-op Mathematics student, based on high academic achievement, extra-curricular activities and personal characteristics.

Financial Executives Institute Prize
An award valued at $500 has been established by the Hamilton Chapter of the Financial Executive Institute. The award is presented annually to the student in any Honours Accounting program in Arts or Mathematics who has displayed outstanding achievement in finance.

Fine Arts Art History Scholarship
One award presented annually to a deserving Fine Arts major who has completed with distinction three years of Art History studies and elects to continue in the fourth year of the Honours Arts History Program.

First Year Engineering Prizes
Prizes of $100 are awarded annually to the top female student in each stream at the end of first-year Engineering who is continuing in the Engineering Program.

John Fisher Award For Leadership
The Sandford Fleming Foundation has established the John Fisher Award for Leadership in recognition of the outstanding contributions made towards the work of the Foundation by its former Chair, Dr. John Fisher. The award, consisting of a citation and a honorarium of $1000, is made from time to time to a graduating Engineering student who has made significant contributions to Co-operative Engineering education. Nominations, which can originate from student groups or faculty members, should be directed to the Waterloo Chapter Awards Committee Chair of the Sandford Fleming Foundation.

Sandford Fleming Debate Awards
The Sandford Fleming Foundation has established the Sandford Fleming Debate Awards in order to encourage the art of debate among Engineering undergraduates. The Debates are held each term and awards of $100 each are made to members of the winning team and of $50 each to members of the runner-up team.

Sandford Fleming Medal for Academic Excellence
The Sandford Fleming Foundation has established six medals for graduating students, one in each of the following Engineering programs: Chemical, Civil, Electrical, Mechanical, Systems Design and Management Sciences. In each Department, the award is made to the student with the best academic record in the last six academic terms of the undergraduate program.

Sandford Fleming Medal for Co-operative Proficiency
The Sandford Fleming Foundation has established medals for graduating students, one in each of the following Engineering programs: Chemical, Civil, Electrical, Mechanical and Systems Design. In each Department, the award is made for outstanding overall performance in both the work-term experience and the academic program of Co-operative Engineering education. The nominees are selected jointly by the Academic Faculty and the Department of Co-operative Education and Career Services.

David M. Forget Memorial Award in Geology
Established in memory of David M. Forget, a $200 award will be made annually to a student enrolled in any Year Two Honours Earth Science Program. Students who can demonstrate an interest in geology combined with a love and respect for nature, display a good ability and interest in writing and can display dedication to studies should write a short essay (less than 1,000 words) explaining their interest in this award and addressing the criteria as stated above. Application essays should be submitted to the Scholarship and Awards Chair, Department of Earth Science, before the final day of lectures of the 2A term.

Jacqueline Forster Prize in French Language
A prize of $100 is awarded annually in honour of her FR 155/156 students by Jacqueline Forster, French language instructor at UW from 1976 to 1989 and recipient of the Distinguished Teacher Award in 1989. This prize is awarded to the most promising on-campus student in FR 156 who intends to specialize in French.

Mark Forster Memorial Scholarship
This scholarship was established by friends, relatives and classmates of Mark Cameron Forster, BSc, in recognition of his contributions to the Kinesiology and Athletics programs at the University of Waterloo. The awards will be presented annually to a third- or fourth-year Kinesiology student who has achieved a minimum B average, has participated in varsity athletics, has a high level of involvement in the athletics program and has contributed to the Kinesiology program as a Kinesiology Student Association member or through other activities. Applications should be submitted by January 10th each year.

Andrea Fraser Memorial Scholarship
This scholarship was established by classmates, relatives and friends in memory of Andrea Louise Fraser, BSc. The award is presented to a third- or fourth-year Kinesiology student who holds a minimum B average, shows a special interest in rehabilitation and is widely involved in class and athletic endeavours. Applications must be submitted to the awards office by January 30th.

Department of French Prize
A prize of $100 is awarded annually by the Department of French to the fourth-year French major who attains the highest overall average in French.
**Gandalf Data Limited Award**
An annual award of $1,000 is available to an outstanding undergraduate or graduate student in Electrical, Systems Design or Computer Engineering who is in need of financial support to continue studies and who has an interest in the data communications industry. Students in 1B or above are eligible to apply.

**Michael Gellner Memorial Scholarship**
An award is presented annually to a Health Studies or Kinesiology student entering her/his fourth year. This award is to be given to a deserving student with an excellent academic record, who will complete a degree in either of the above programs. Preference will be given to a student who has demonstrated interest in heart-related research. Applications should be submitted in 3B or the 2nd term of third-year Regular Program.

**General Proficiency Medal**
The gift of the Council, College of Optometrists of Ontario is awarded to the final-year student in the School of Optometry ranking highest in general proficiency.

**Robert E. Gobeil Auditing Scholarship**
The Robert E. Gobeil Auditing Scholarship valued at $600 has been established by Alcan and many friends of Mr. Gobeil at the University of Waterloo, where Mr. Gobeil was a founding member of the University’s Accounting Advisory Council. The scholarship is awarded annually, based on academic excellence, to a student entering the Professionally Accredited Stream (PAS) in Honours Accountancy Studies who intends to pursue a career in either internal or external auditing. The emphasis on internal or external auditing was based on Mr. Gobeil’s considerable interest and service to both the Institute of Internal Auditors and to the Chartered Accounting profession in Canada.

**Governor General’s Academic Medal**
The Governor General of Canada provides one silver medal annually to the undergraduate student graduating with the highest academic standing.

**Dr. Michael Gutwein Memorial Award**
This $500 award and plaque has been made possible by contributions from classmates and friends in memory of Dr. Michael Gutwein. The award, which is not based on academic criteria, will be given to a final-year Optometry student who actively encourages fellow students to participate in athletic and social affairs.

**The Sir Casimir Stanislaus Gzowski Medal for Excellence in Communication**
The Sir Casimir Stanislaus Gzowski Medal is awarded to graduating students in the 4B term in Civil Engineering who have demonstrated excellence in communication ability through the submission of outstanding work reports during their undergraduate careers at the University of Waterloo and through the oral presentation of one of these reports in a competition during the last (4B) term of the academic program.

**Don Hayes Award**
This award is given annually to a deserving undergraduate student who has a minimum B average and is involved in, or contributes to, athletics or the sports therapist function in the University or the community. Letters of recommendation and the special application should be forwarded to the Student Awards Office by mid-January.

**Percy Hermant Centennial Bursary Scholarships**
These are the gift of Sydney Hermant. The Bursary Scholarships are awarded on the basis of financial need and academic achievement in first-year General Science at any Canadian university to a student who is proceeding into Year One, School of Optometry. Six scholarships are available, each of a total possible value of $2,000, being $500 per year over the four professional years (Years One, Two, Three and Four) provided a satisfactory standing is maintained. One scholarship is awarded to a student who is a resident of one of the Maritime provinces; two scholarships are awarded to students who are residents of Ontario; three scholarships are awarded to three students who are residents of the Western provinces. The various Provincial Optometrical Associations are consulted in awarding these bursary scholarships. Applications should be submitted to the Student Awards Office before September 15th of each year.

**Percy Hermant General Proficiency Prizes**
The gifts of the Hermant Family are awarded to the final-year students in the School of Optometry ranking first and second in general proficiency.

**Hewlett-Packard (Canada) Limited Award**
Thirty calculators will be awarded to the top ten students entering second-year Engineering, Mathematics and Science.

**Lynn Holmes Memorial Award**
An award of $500 is presented annually to a Fine Arts student who has completed with distinction three years of studio work and elects to continue in the fourth year of the Honours Program.

**Hyde Houghton Centennial Scholarship**
A scholarship valued at $1,000 is awarded annually to the student who is entering the Professionally Accredited Stream (PAS) in the Honours Accountancy Studies Program and who has attained the highest academic standing at the point of entry. The award includes an offer of employment during the internship year, although acceptance of employment is not a condition of the award.

**Huron County Scholarships**
Huron County Council is offering two $200 scholarships to be awarded to the male and female from Huron County who obtain the highest standing regardless of the year in which he or she is registered.
Institution of Production Engineers Canadian Council Award
This prize consists of a book and a one-year membership in the Institution. It is awarded annually to the best all-round fourth-year student in the production and manufacturing option of Mechanical Engineering, based on academic standing and involvement in student affairs. The award was established in memory of Stan Thurgar and all the members of the Institution who have conscientiously worked for the good of Canadian industry.

William (Bill) Jack Award for Aggregate Related Issues
The William Jack Award valued at $2,500 has been established by the Aggregate Producers Association of Ontario (APAO) to honour the past and continuing contributions of Bill Jack, one of its former Presidents. The Scholarship is awarded annually based on the best contribution to “Aggregate Industry Issues” in the form of an essay or technical report prepared by an undergraduate student at the University of Waterloo.

Kaderall Prize for Excellence
A prize fund of $500 is awarded for design excellence for students in the final year of the Architecture Program.

K-W Optical Company Awards
Awards are made to the two students in each of the second, third and fourth professional years in Optometry who have shown the greatest improvement in academic standing. In the fourth professional year the awards are for $250 and $200. In the other years the awards are for $200 and $150.

Bruce Wyler Kelly Memorial Prizes
Two prizes valued at $150 each are awarded to the two Science students with the highest standing at the end of Year Two. One prize is to be awarded to a student in Regular or Co-op Honours Biochemistry and one prize to a student in Regular or Co-op Honours Biology.

W.W. King Exchange Fellowship
Undergraduate Engineering students who participate in one of the active exchange programs between the University of Waterloo and overseas engineering schools are eligible for financial assistance through the W.W. King Exchange Fellowship. Recipients must be on the Dean’s Honours list prior to the exchange and before receiving the fellowship. The maximum amount per student is $500.

Jeanne Le France Scholarship
The Jeanne Le France Scholarship valued at $100 is awarded in honour of Professor Jeanne Le France who taught French-Canadian literature at Waterloo from 1966 to 1979. Eligible for the award are students entering their fourth year of a degree with French as a single or joint specialization and who qualify for a Faculty of Arts Upper Year Scholarship for that year.

Leopold LaCourciere Award for General Proficiency
The Sudbury Association of Optometrists presents an award of $250 annually to the top final-year student of the School of Optometry who was a resident of District #3 at the time of acceptance to the School.

James D. Leslie Prize
This $100 Leslie Prize was established to recognize the contribution of Professor J.D. Leslie, the first Director of the Correspondence Program. It is awarded to the graduating student with the highest average who has completed at least 50% of his or her credits through the University of Waterloo Correspondence Program.

Lieutenant Governor’s Medal for Architecture
The medal is awarded to the fifth year’s top academic and design student in Architecture.

Lyle/Fisher/Bobier Prize
This prize is awarded annually to a student in the Optometry Program who has demonstrated academic excellence and is engaged in Summer research at the School of Optometry. It was established to honour the contributions of Professors Lyle, Fisher and Bobier to optometric research.

Donald C. MacKenzie Prize in Latin
This Latin prize of $100 is awarded annually to the student who attains the highest mark in LAT 203/204. To qualify for a prize the student must enrol in a further Latin course at the 200- or 300-level.

Douglas T. MacPherson Scholarship
AOCO Limited/Limité presents annually the Douglas T. MacPherson Scholarship to a Canadian student admitted to the first professional year of the School of Optometry. This $1,000 award is made on the basis of academic achievement.

Management Accounting Student of Merit Award
The Management Accounting Student of Merit Plaque and Award valued at $500 is offered by the Society of Management Accountants of Ontario each year. The award is given to an Accountancy Studies student in PAS III who has an outstanding performance in ACC 381, 382 and 680. The winner is selected by the Management Accountancy Studies area.

J.R. Matthews Memorial Prize in Biology
The colleagues, friends and relatives of the late Dr. Jonathan R. Matthews offer an annual $200 prize to the student who graduates from the Honours Biology (or Biochemistry) program with the highest overall average in third- and fourth-year courses.

Ron May Memorial Award
A $500 award has been established in memory of Ron May, a member of the first Honours Co-op Recreation Class of 1973. This award is given annually to a third- or fourth-year Honours Co-op Recreation and Leisure
Studies student who has maintained a minimum B average and who is involved in, or has contributed to, intramural athletics and has demonstrated interest and involvement in community recreation and sport activities. Letters of recommendation and the application should be forwarded to the Student Awards Office by October 15th.

**McDonald's Second Year Fine Arts Scholarship**
McDonald's Restaurants of Canada has made available a scholarship with a value of approximately $200 to be awarded to a full-time Fine Arts major on the basis of performance in first-year courses and presentation of a portfolio.

**John McKay Memorial Award**
This award has been established in memory of a student who died in an airplane accident while on a work term in Northwestern Ontario. Interest from an endowment is awarded annually to a Co-op Geography student who is completing the 4B term. Candidates are selected on the basis of good academic standing, work-term performance, and broad involvement in the Co-op Program and class activities.

**J.C. McKegney Memorial Award**
Two awards are presented annually to upper-year students in the Faculty of Arts who have shown outstanding academic performance and/or extra-curricular interests in the Hispanic Area: one in Peninsular Spanish Studies and one in Spanish American Studies. Applications should be submitted no later than February.

**Harry McLeod Co-op Chemistry Scholarship**
A scholarship is normally awarded annually to a high-ranking student entering Year Four of the Co-op Chemistry Program, selected on the basis of academic performance in 3A and 3B terms. No application is necessary.

**Mediacom Inc. Scholarship**
An annual scholarship of $400 is awarded to a third- or fourth-year student in Urban and Regional Planning based on high academic standing and an interest in planning.

**Jerome T. Miller Memorial Prize**
A $50 prize was established in 1968 by relatives and friends in memory of the late Jerome Thomas Miller, BSc, MSc '66 (Honours Chemistry and Physics). The cash prize is awarded each year, on the basis of marks, to the student in third year of a program which combines studies in Chemistry and Physics.

**Mike Moser Memorial Fund**
Awards are provided to deserving third- and fourth-year students who have financial need, a good academic record, and who have achieved a high level of accomplishment in extra-curricular activities. A bursary application plus a resume and letters of reference should be directed to Neil Widmeyer, Faculty of Applied Health Sciences. Special application is required.

**Murata Erie North America, Ltd. Award**
Two awards of $600 each are given to students entering fourth-year Electrical or Computer Engineering based on outstanding performance in courses related to analog circuit design and measurement. Applications should be submitted during the 3B term.

**Herb Nemeth Scholarship**
A $200 scholarship is awarded to a student entering third or fourth year who has achieved the highest marks in three regional geography courses and who has an average of over 75% in all Geography courses.

**New Brunswick Association of Optometrists Scholarship**
The New Brunswick Association of Optometrists presents a scholarship in the amount of $250 to a resident of New Brunswick who is entering the first professional year of Optometry.

**Norcen Energy Computer Science, Geological and Chemical Engineering Awards**
Three awards of $1,200 are awarded to outstanding undergraduate students entering Year Two or above in Computer Science, Geological Engineering and Chemical Engineering. Awards will be allocated to students who have demonstrated a strong interest in extra-curricular activities and have evidence of leadership qualities. Consideration may be given to financial need. Applications should be submitted by October 30th each year.

**Ocular Pharmacology Prize**
A cash prize is awarded to an outstanding Optometry student for performance in the Ocular Pharmacology course.

**OIRCA Award**
A sum of $1,000 is provided by the Ontario Industrial Roofing Contractors Association annually. This is awarded for the best submitted folio of work open to all students in the School of Architecture. Selection of the winner is made by four judges, two of which are invited external experts.

**Ontario Association of Architects Medal**
A medal of gold, silver or bronze is awarded to a graduating student (BArch) for excellence in architectural design.

**Ontario Association of Architects Second Year Award**
The award of $1,200 is based on studio performance in second year and overall performance up to the second year.

**Ontario Association of Architects Third Year Award**
An award of $1,200 is based on studio performance in third year and overall performance up to third year.

**Ontario Hydro Electrical Engineering Award**
An annual award of $1,700 is made to a student entering third-year Electrical Engineering who has good academic standing, strong written and oral communications skills,
has demonstrated leadership ability and has been involved in extra-curricular activities within the University or community. Applications should be submitted during the 2B term.

Ontario Rubber Group/Rubber Chemistry Division, CSC Award
The Ontario Rubber Group and the Rubber Chemistry Division of the Canadian Society for Chemistry have made available two $750 awards. The recipients must be in either Engineering or Science, have demonstrated interest in the rubber industry and have high academic standing. Consideration will also be given to experience gained in work terms in a rubber-related field. Applications should be submitted during the 3B term.

Optometric Services Award for Excellence in Practice Management
Optometric Services Inc., the national optometric services group, presents annually an award valued at $225 to the final-year student in the School of Optometry, who has demonstrated leadership with excellent academic standing, in the areas of professionalism and communication skills.

Optometry Faculty Summer Research Scholarships
The faculty of the School of Optometry provide funds for these scholarships to support Summer research by Optometry students. These scholarships are awarded on the basis of merit using the same criteria as the Natural Sciences and Engineering Research Council of Canada uses to award Undergraduate Student Research Awards.

Marcel Pequegnat Scholarship
A $1,200 scholarship may be awarded to a full-time student who has completed the third year of study in resource management or a related field and who intends to continue in this program. Foundation applications are available in the Student Awards Office and must be submitted during the 3B term or the third year of the Regular program.

Plastic Contact Lens Outstanding Achievement Award
This award of $1000 and an engraved plaque is presented annually by the Plastic Contact Lens Company to the student completing the third-year professional program in Optometry who attains the highest mark in OPTOM 347 and demonstrates clinical proficiency.

Political Science Prizes
There are annual prizes of $100 awarded by the Political Science Department to the third- and fourth-year majors with the highest cumulative averages in their Political Science courses taken in the previous years. There is a $150 prize for the graduate with the highest Political Science average in his or her fourth year.

Pollution Probe at Brantford Award
The award is made annually to a deserving student from Brant County who has an excellent academic record in a program in Environmental Studies, preferably entering second year.

Awards and Financial Aid
Undergraduate Awards

Professor T. Prasad Award
The Professor T. Prasad Award valued at $500 is presented annually to an outstanding Faculty of Engineering undergraduate who has exemplified a new direction in his/her academic efforts by demonstrating an increase in term average from 2B to 3A.

Pure Math Book Prize
Awarded to an outstanding student of Pure Mathematics.

QUANTUM Information Resources Limited Award(s)
Six awards valued at $1,000 each are available for full-time Co-op Computer Science students entering Year Two. The Awards are based on financial need as well as academic standing. Applicants should have a minimum overall academic average of 75% or higher at the end of Year One to be considered. Completed application forms must be submitted to the Student Awards Office during the first month of the 2A term.

Ready Mixed Concrete Association of Ontario Scholarship
Two scholarships of $250 each are awarded to students in 3B Civil Engineering who are residents of Ontario, who have demonstrated particular interest in the use of concrete and reinforced concrete and who have obtained a high average in related courses. Consideration will be given for experience gained in work terms which involved working with concrete. Applications should be submitted during the 3B term.

Recreationists’ Association of West Central Ontario Scholarship
One award valued at $100 is presented to a third-year Recreation and Leisure Studies student based on exceptional performance on field placement, volunteer work, and involvement in school activities. A minimum overall average of B will also be required. In addition to the cash award, a one-year free membership in RAWCO and a commemorative plaque will also be awarded. Applications should be submitted during the 2B term.

Glyn Reesor Prize
A prize of approximately $200 in honour of Dr. Reesor is awarded annually to the third-year Physics student who obtains the highest mark in electronics.

Richard B. Rodger Memorial Prize
This book prize was established with funds contributed by relatives and friends in memory of the late Richard B. Rodger, BES ’71 (Geography). The book is awarded each year, on the basis of marks, to a Geography student completing the third year of study.

Royal Architectural Institute of Canada Medal
The medal is awarded to a graduating student on the basis of high proficiency in the BArch Program.

Lorne H. Russwurm Memorial Scholarship
An annual scholarship valued at $600 has been established in memory of Lorne Russwurm, an internationally
known researcher and a Professor of Geography from 1967 until his death in January 1987. Professor Russwurm was highly regarded by students for his excellence as a teacher and advisor. The recipient will normally be an undergraduate Geography student entering second, third or fourth year who began studies as a mature student. No application necessary.

**Saskatchewan Optometric Association Scholarships**
The Saskatchewan Optometric Association presents two scholarships of $500 to each of two students admitted to the first professional year of the School of Optometry. These awards are made to students who are residents of Saskatchewan. They are awarded on the basis of academic achievement.

**Marj Schaefer Prize in Architecture**
An annual $300 award is presented to an Architectural student who has been elected to serve on one of the School committees and who combines academic proficiency with a contribution to student affairs and student life in the School of Architecture.

**Science Memorial Scholarships**
These awards honour deceased students, alumni, faculty, staff and friends of the Faculty of Science. Awards are made, as funds permit, to students at any level in an undergraduate program in the Faculty on the basis of academic achievement. Contributions have been received in memory of:

- Alfred Babineau
- Nancy O. Bray
- J.L. Daniel
- Nicola Duthie
- Anne Fiedtkou
- Roman Guzowsky
- David Lamb
- Wade Mesher
- Mary R. Mitchell
- E.J. (Ted) Mulrooney
- Robert G. Sommerville
- Michael Souliere

**Shell Canada Limited Award**
One award valued at $1,000 is available to a third- or fourth-year Engineering or Computer Science student who has an interest in the petroleum industry, has achieved a high level of academic excellence and has demonstrated an interest in extra-curricular activities. Applications should be submitted by September 30th each year.

**Smale Fellowship**
The award of $800 is based on work in the fourth-year (BArch) program, leadership ability and academic and design excellence.

**Society of Chemical Industry Awards**
An engraved plaque is awarded by the Society to the student with the highest standing in the final year of Biochemistry, Chemistry and Chemical Engineering.

**Society of Manufacturing Engineers Awards**
Four awards of $150 each are available to students in Mechanical, Electrical, Chemical and Systems Design Engineering. The awards are given on the basis of an outstanding written report or project related to the field of manufacturing engineering.

**Spanish Book Prizes**
In conjunction with the Spanish Embassy, four books will be awarded annually to the most deserving students in Beginning, Intermediate, Honours and Correspondence Spanish.

**H.A. Stein Scholarship**
A $500 scholarship is awarded to a student who has demonstrated academic excellence in the Optometry Program and who has applied and been accepted to spend a Summer in Optometrical Research support.

**Student Industry Field Trip Award/CSPG**
The Canadian Society of Petroleum Geologists makes available one award consisting of a certificate and a one-year membership in the Society. The award is presented to a student in either Earth Sciences or Geological Engineering who has demonstrated competence in petroleum geology or the related fields of stratigraphy, sedimentology, paleontology or structural geology.

**Sun Life of Canada Award**
This $500 award is awarded to an outstanding student who is entering the third year of the Honours Actuarial Science Program. Applications should be submitted during the 2B term.

**Superlite Research Scholarship**
The Superlite Research scholarship is awarded to a student entering the third professional year of the Optometry Program who has demonstrated academic excellence in Physiological Optics and who wishes to undertake research in this field during the Summer. The candidate for this award will be selected by the Graduate Committee of the School of Optometry.

**Sweets Catalogue Prize**
An award of $1,500 is made available annually by McGraw-Hill for outstanding design work in the fifth year of the Architecture Program.

**J.C. Thompson Memorial Prize**
The $125 Award of the Alumni Association in memory of the late Dean J.C. Thompson is made to the final-year student in the School of Optometry who has ranked highest in clinical courses in Optometry (OPTOM 242, 252, 342 and 352).

**John Hin Chung Tsang Memorial Scholarship**
A scholarship of $750 is available annually to a student entering second year of a four-year Honours Mathematics Program. Selection of candidates is based on academic achievement. The award has been endowed by Mrs. Pauline Tsang, through the Education Foundation of the Federation of Chinese Canadian Professionals of Ontario, in memory of Mr. John Hin Chung Tsang.

**University of Mannheim Exchange Scholarship**
Travel, accommodation and living allowance are provided for a student of the "Waterloo in Germany Program" for a year of study at the University of Mannheim.
University of Waterloo Alumni Gold Medals
University of Waterloo Alumni provide a maximum of six gold medals annually to be awarded in recognition of academic excellence. Each medal will be awarded on the recommendation of the Dean of a Faculty. The medals may be awarded, at either the Spring or Fall Convocation, as follows: one each to a student in each of the six Faculties of the University who has demonstrated outstanding academic performance on completion of an undergraduate degree program.

R.H. Walters Award
One or more awards, based on academic excellence, are made each year to outstanding students in the Honours Psychology Program.

Reginald Williams Memorial Scholarship
The award of $250, donated by Dr. L. Williams of Trinidad, is awarded to an outstanding student in the second professional year in the School of Optometry.

Jack Wiseman Award
Two awards are presented annually to a third- or fourth-year Civil Engineering student who submits a work report in the area of construction or project management which is graded "outstanding" and demonstrates an appreciation for the integration of design concepts and construction principles.

Michael Wright Memorial Scholarship
Three hundred dollars is awarded to an outstanding student in a course in Political Science. Established in 1975 in memory of Michael Wright by his mother and sister.

M.S. Yolles and Partners Limited Scholarship
An award of $500 is made to one Civil Engineering student in each of the 3B terms. The award is to be made to a student who is interested in a career in structural engineering and, in particular, the design of buildings. The award is intended to encourage those students who plan on a career in Consulting Engineering. The award is conditional upon the student taking the structural analysis and design stream in the 4A and 4B terms. Applications should be submitted during the 3B term.

Tom York Memorial Award
The Tom York Memorial Award was established in memory of Dr. Thomas L. York (1940-88), writer, scholar, adventurer, and pastor, who served the University of Waterloo and Wilfrid Laurier University as Chaplain from 1985 until his death. The award will be given for prose fiction creative writing. Undergraduate or graduate students in any faculty, program or year, full or part time, may apply for this award by sending an item of prose unpublished, to TYMA Selection Committee, c/o Dr. Pauline Greenhill, St. Paul's United College, Westmount Road, North, Waterloo, Ontario N2L 3G5.

Work-Term Report Awards
All of the following are awards for work-term reports judged best for writing skills. The technical content of the report is important but not the most important factor. The awards are made each term and the winners will be determined by the Department of Co-operative Education and Career Services in consultation with the appropriate academic department. Reports considered confidential are not eligible.

Allen-Bradley Canada Limited Awards
Three awards of $100 each to second-, third- or fourth-year Electrical or Computer Engineering students.

Babcock & Wilcox Canada Limited Awards
Three awards of $100 each to second-, third- or fourth-year Mechanical Engineering students.

Borden Chemical Company Canada Limited Awards
Three awards of $100 each to second-, third- or fourth-year Applied Chemistry students.

Dofasco Awards
Six awards of $100 each to Civil, Computer, Electrical, Mechanical and Geological Engineering students following their first work term and three awards of $100 each to second-, third- or fourth-year Applied Mathematics students.

Dow Canada Awards
Three awards of $100 each to second-, third- or fourth-year Mathematics, Non-Specialist students.

George J. Dufault Awards
The George Dufault Awards arise from a fund established by the Sandford Fleming Foundation from contributions made by faculty, staff, students and friends in memory of the late Professor George Dufault of the Department of Electrical Engineering. Awards of $100 each are given to undergraduate students in Electrical and/or Computer Engineering for the best work-term reports in their class. Up to four awards are given in each calendar year.

Eli Lilly Canada Inc. Awards
Three awards of $100 each to second-, third- or fourth-year Biochemistry students.

Equitable Life Insurance Company of Canada Award
One award of $100 to a second-, third- or fourth-year Actuarial Science student.

Sandford Fleming Foundation Awards
Awards of $100 each to second-, third- and fourth-year students in those classes of each undergraduate Department of Engineering in which industrially sponsored awards have not yet been established.
The Sir Casimir Stanislaus Gzowski Award for Work-Report Proficiency
This award, in the amount of $100, is presented to a Civil Engineering student in each of the 1B Spring and 2A Fall terms, provided in each case that the student is in good academic standing. It is given to the student who has submitted the best work report (graded 'Outstanding') in the class in the first work term. In the event that no student completes an 'Outstanding' work report, no award will be presented.

Inco Limited Awards
Three awards of $100 each to second-, third- or fourth-year Systems Design students.

Institute for Improvement in Quality and Productivity Award
Up to nine awards of $100 each to second-, third- or fourth-year Engineering, Mathematics or Arts Accounting students.

Institute for Polymer Research Award
Three awards of $100 each to second-, third- or fourth-year Chemical Engineering or Applied Chemistry students.

R.M. Irving Work Term Report Award
Awards of $100 to second-, third- or fourth-year Geography students.

S.C. Johnson & Son Limited Awards
Three awards of $100 each to second-, third- or fourth-year Chemical Engineering students.

Kerr Addison – Minnova Inc. Work-Term Report Award
Three awards of $100 each to second-, third- or fourth-year Science students.

Labatt Brewing Company Work-Term Report Award
Three awards of $100 each to second-, third- or fourth-year Biology students.

MacLaren Engineers Inc. Awards
Three awards of $100 each to second-, third- or fourth-year Civil Engineering students.

Manulife Financial Work-Term Report Award
One award of $100 to a second-, third- or fourth-year Actuarial Science student.

Microsoft Corporation Award
Three awards of $100 each to third- or fourth-year Computer Science students.

Morrison Beatty Limited Award
Awards of $100 each to second-, third- or fourth-year Geography students.

Motorola Canada Limited Award
Three awards of $100 each to second-, third- or fourth-year Applied Mathematics, Business Administration, Combinatorics and Optimization, Operations Research, Statistics or Teaching Option students.

Mutual Life Assurance Company of Canada Award
One award of $100 to a second-, third- or fourth-year Actuarial Science student.

Northern Telecom Canada Ltd. Work-Term Report Award
Nine awards of $100 each to second-, third- or fourth-year Electrical or Computer Engineering, Systems Design Engineering and Computer Science/Information Systems Option students.

Nova Petrochemicals Inc. Awards
Two awards of $100 each to Chemical Engineering students following their first work term.

Peat Marwick Thorne Work-Term Report Awards
Three awards of $100 each to second-, third- and fourth-year Arts or Mathematics/Chartered Accountancy Option students.

Procter & Gamble Inc. Work-Term Report Award
Three awards of $100 each to second-, third- or fourth-year Mechanical Engineering students.

QUANTUM Information Resources Ltd. Award
Three awards of $100 each to second-, third- or fourth-year Computer Science students.

Walter Runge Award
One award of $100 to a first-year Computer Engineering student.

Society of Management Accountants of Ontario Awards
Three awards of $100 each to second-, third- or fourth-year Mathematics/Management Accounting students.

Waterloo-Wellington Chartered Accountants Association Awards
Three awards of $100 each to second-, third- or fourth-year Arts or Mathematics/Chartered Accountancy Option students.

Xerox Research Centre of Canada Limited Awards
Three awards of $100 each to second-, third- or fourth-year Applied Physics students.
Bursaries

Bursaries are awarded to full-time undergraduates experiencing financial difficulties and normally maintaining a B average. Students must have completed at least one term at the University of Waterloo before applying for these bursaries. Students with Student Authorizations who have not been in Canada for more than one year will not normally be considered (see Barkley's of Avonmore Bursary and Foreign Student Bursary). Students in a Regular Program should apply in the Winter term, by January 31st. Students in a Co-op Program should apply by the last day of the month in which lectures begin (limited funds may restrict applicants to one bursary per academic year). Applicants need complete only one bursary application to be considered for most bursaries, unless a special application is required. Bursary applications are available from the Student Awards Office.

Jerzy W. Anders Memorial Award
A $500 award has been established in memory of Jerzy Anders, a graduate of the University of Waterloo. The award is given to mature individuals who were forced to interrupt their university education due to financial difficulties or family obligations and are experiencing financial hardship upon re-entering the academic world. Mature students experiencing financial difficulties should write to the Student Awards Officer detailing their circumstances.

Atkinson Charitable Foundation Bursaries
The Foundation has established a bursary program which gives assistance to students of merit and proven financial need. Awards are made only to students who are bona fide residents of the Province of Ontario.

BP Canada Bursary
Two bursaries of $500 are offered annually to two students enrolled in Earth Sciences, Engineering, Commerce or Economics at the University of Waterloo.

Barkley's of Avonmore Bursary
One bursary is awarded annually to a student from a Third World Country. Foreign students must complete a special bursary application form and arrange an appointment with the Student Awards Officer.

J.P. Bickell Foundation, Trustees, National Trust Bursaries
The Foundation makes available a sum of money to be used in providing bursary assistance to Chemical Engineering and Earth Sciences students of good academic standing who need financial assistance.

Biology Club Bursary
This $200 bursary, donated by the Biology Undergraduate Society, is available to any undergraduate student registered in the Biology Department.
the spirit of friendship within the School. Preference will be given to female applicants. Special application is required by November 30th.

**Emco Limited Bursary**
Emco Limited has established a bursary program available to upper-year students in Computer Science, Mechanical and Electrical Engineering.

**Federation of Students – UW Bursary**
Bursaries will be awarded to full-time undergraduate students experiencing financial difficulties, maintaining a B average and who are active in campus student organizations.

**Foreign Student Bursary**
A $50 bursary has been established by the Committee for Emergency Relief for Foreign Students. Foreign students experiencing financial difficulties should complete the bursary application and arrange an appointment with the Student Awards Officer.

**K.D. Fryer – F.A.S.S. Award**
A bursary fund has been established in memory of Kenneth D. Fryer, one of the founders and long time supporters of the F.A.S.S. theatre company. Funds are available to full- and part-time students at any level in any discipline offered by the University of Waterloo. A minimum average of 60% will be required of the applicants and financial need, as determined by the Awards Office, will be the basis for awarding these funds.

**William H. Gale Bursary**
One bursary of $250 is awarded annually to a second-, third- or fourth-year student in Co-op Applied Economics.

**J.G. Hagey Alumni Bursary**
In memory of J.G. Hagey, President Emeritus of the University, and in recognition of his significant contributions to post-secondary education, the Alumni Association has established a bursary fund. Several bursaries to a maximum of $200 each are awarded annually to students showing financial need. All students attaining a 60% or equivalent standing in their previous academic years are eligible to apply.

**Huron County Bursaries**
Huron County Council has established a bursary fund at the University of Waterloo for students who attended high school in Huron County and whose home is in the County. The bursaries are awarded to full-time undergraduate students in any faculty of the University who have good academic records and who are in need of financial assistance to enable them to continue their studies.

**Interprovincial Pipe Line Company Bursary**
The Company provides $2,000 for bursaries for students beyond the first year who are in need of financial assistance. At least 50% of the funds must be awarded to students in Engineering. Preference will also be given to students whose normal residence is in Canada or the USA.

**K-W Professional Engineers Wives’ Association Bursary**
Two awards of $100 each are given to a male and female student in Engineering who are experiencing financial difficulties.

**Kitchener-Waterloo Community Foundation Bursary**
A bursary of $500 may be awarded annually to a full-time student from the Kitchener and Waterloo area registered in a Visual Arts or Music Program, Kinesiology, Recreation and Leisure Studies, Architecture, Arts or Math/Chartered Accountancy Option.

**Hildegard Marsden Bursary Fund**
A bursary fund has been established in memory of Hildegard Marsden, Dean of Women for more than 20 years, for her service to students and the University of Waterloo community at-large. This award is for students in third or fourth year of their degree program who demonstrate financial need, and is given in the Winter term. Preference will be given to female applicants. An application form must be submitted to the Student Awards Office by January 31st.

**Ira G. Needles Memorial Bursary Fund**
A bursary fund has been established in memory of Ira George Needles, one of the founding fathers of the University of Waterloo, Chairman of the Board of Governors from 1956 to 1966 when he was named Chancellor. Bursaries are awarded to full-time undergraduate students experiencing financial difficulties and who have maintained a B average.

**A.C. Nielsen Company of Canada Ltd. Bursary**
A.C. Nielsen Company of Canada Ltd. has made available two bursaries each in the amount of $500, to be awarded to two Computer Science students at the University of Waterloo. The awards are presented on the basis of financial need and academic standing.
A.F. (Tony) Pickard Memorial Award
One award valued at $150 has been established in memory of A.F. (Tony) Pickard, former Research Co-ordinator; Applied Analysis and Computer Science, at the University of Waterloo. Undergraduates enrolled in the Faculty of Mathematics who have an active interest in Computer Science and show academic promise combined with financial need may apply for this award.

Pink Tie Bursary
A bursary fund has been established by the Math Society for undergraduate Mathematics students. Special consideration is given to Mathematics students who have been involved in extra-curricular activities. A minimum overall average of 60% is required, as well as a demonstrated need.

Procor Limited Bursary
A bursary, to the value of $100 is offered annually by Procor Limited. The bursary is to be awarded to students in the Faculty of Engineering who are in need of financial assistance and who have satisfactory academic standing.

Abraham Rosenberg Memorial Bursary
A bursary fund has been established in memory of Abraham Rosenberg, a former member of University of Waterloo Board of Governors.

Serendipity Bursary
A bursary fund has been established by Samuel Malenfant, Bachelor of Integrated Studies, 1976. The bursary is awarded to a full-time undergraduate registered in Independent Studies.

Alan W. Shattuck Memorial Bursaries
Three bursaries of $500 are awarded annually on the basis of academic standing and financial need to students in fourth-year Civil Engineering. The funds were made available by associates of Mr. Shattuck in recognition of his contribution in both pollution and water control resources.

Suncor Inc. Bursary Fund
Suncor Inc. offers bursaries annually to students in Chemical or Mechanical Engineering which, in support of employment equity, will be awarded to women, aboriginal (native) Canadians, persons with disabilities and visible minorities. Interested students should apply on the University of Waterloo general bursary application and attach a letter indicating their eligibility for assistance from this source.

University of Waterloo Bursaries
The University has established a bursary fund to assist students who have a proven financial need. Bursaries are awarded to full-time undergraduates in any faculty of the University.

University of Waterloo 25th Anniversary Bursaries
These funds were established by the University from the sale of anniversary souvenirs in the Bookstore along with proceeds from many anniversary events in recognition of the 25th Anniversary of the University of Waterloo. Bursaries are awarded to full-time undergraduate students in any faculty who are in need of financial assistance.

3M Canada Inc. Bursaries
Four bursaries valued at $500 are awarded as follows: one to an Engineering student and the remaining three to students in either Business, Science or Computer Science-related fields.

University Loan Funds
The Awards Office administers a number of emergency loan funds which are intended to provide emergency assistance to students experiencing temporary, short-term financial problems. The funds are provided on an interest-free basis for a stipulated period of time.
To be eligible for these loans, students must be in good academic standing and must provide proof of an acceptable source of repayment. Students wishing to obtain assistance from one of the following funds should apply to the Student Awards Office.

Accounting Alumni Emergency Loan Fund
Loans up to $200 for a maximum of 90 days are available to full-time undergraduate Honours Accountancy Studies or Honours Math/Accounting Program students experiencing short-term financial difficulties.

Alpay, Elligsen, Nicoll Memorial Loan Fund
This fund was established by the Sandford Fleming Foundation in memory of Robert Elligsen, a Masters graduate of the Department of Mechanical Engineering (1985) and Professors Alpay and Nicoll, Department of Mechanical Engineering, from funds contributed by faculty, staff and others. Emergency loans are made available to students in the Faculty of Engineering.

Alumni Association Student Assistance Plan
This loan fund has been instituted by the Alumni Association, University of Waterloo.
Loans up to $200 with repayment periods of up to four months are available to students in all faculties.

Arts Student Union Loan Fund
Loans to a maximum of $200 for a period of up to 90 days are available to full-time undergraduates who are members of the Arts Student Union.

Ian Carr Loan Fund
This loan fund has been set up by the parents in memory of their son, a former student at the University of Waterloo.
Awards and Financial Aid
University Loan Funds

David Cook Memorial Fund
The University of Waterloo Mathematics Society has made an amount available to be used as an addition to the University's Emergency Loan Program. The Society's contribution is intended for Mathematics students who have been faced with unexpected expenses during their academic year.

Co-operative Lecture Emergency Loan Fund
This fund was established by Canadian politician T. Douglas in 1970.

Adelaide Detweiler Student Loan Fund
This loan fund was established by Mr. J.R. Detweiler in memory of his mother, Adelaide Detweiler.

Engineering Memorial Loan Fund
The Federation of Students has established an interest-free, short-term loan fund in honour of deceased students of the Faculty of Engineering. Loans are normally to a maximum of $300 for 90 days and are available to first-year Engineering students. To date, contributions have been received in memory of: Marc Cayouette.

Engineering Society "A" Loan Fund
This fund was established by the Engineering Society "A" to assist Engineering students in need of short-term loans.

Environmental Studies Society Loan Fund
Short-term loans are available to full-time undergraduate students enrolled in the Faculty of Environmental Studies. The maximum loan is normally $100. These funds are made available by the Society and represent a part of the proceeds of functions sponsored by the Society.

John Faber Memorial Fund
This fund was established by the Circle K Club at the University of Waterloo in memory of John Faber, former club member. Short-term loans are offered to full-time students at the University of Waterloo.

Sandford Fleming Foundation Loan Fund
This loan fund was established by the Sandford Educational Press to provide emergency short-term loans to Engineering undergraduate students. The loans are normally for $200 or $300, and interest-free for up to 90 days. The Sandford Educational Press is the textbook publishing division of the Sandford Fleming Foundation, and the loan fund has been established from the proceeds of sales of its textbooks.

Graham, Myall, Thomson Memorial Fund
A memorial fund has been instituted by the classmates of the late J. Graham, M. Myall and J. Thomson, who lost their lives in an auto accident in 1969. The fund represents contributions received from their classmates and other interested donors. Loans are made available to students enrolled in the Engineering Faculty and to those who have completed at least one full year of academic study. Maximum loans are $200 with repayment terms extending up to 90 days.

Dorothy J. Guest Friendship Fund
Established by Applied Health Sciences Alumnae and varsity athletes in recognition of the help and encouragement given to them by Dorothy J. Guest, Short-term loans of up to $300 for 100 days may be made available to any female student in Applied Health Sciences or female varsity athlete.

Ginny Lee Memorial Fund
The Federation of Students has established in memory of Ginny Lee a former student, an interest-free, short-term loan fund. Loans are normally to a maximum of $300 for a period of up to 90 days.

Peter H. Nash Student Loan Fund
This loan fund was established by the Faculty of Environmental Studies to mark the retirement of Peter H. Nash, the founding Dean of the Faculty. The fund represents contributions received on this occasion and also in memory of the late Inez Frost Nash. Emergency Loans are made available to students in the Faculty of Environmental Studies. Maximum loans are $300 with repayment terms extending up to 90 days.

Registrar's Office Student Loan Fund
This fund was established in recognition of the University's 25th Anniversary by Rose Klein, a retiring employee of the Office.

School of Optometry Emergency Loans
This fund has been established by the School of Optometry from monies donated by the profession, to provide interest-free loans to Optometry students who have completed or are about to complete third year, registered or not, who are experiencing severe financial hardship. Appointment with the Student Awards Officer is necessary.

University of Waterloo Foreign Student Emergency Loan
Undergraduate foreign students in their final year of studies encountering financial difficulties should arrange to speak with either the Foreign Student Officer or the Student Awards Officer regarding assistance from this source.

University of Waterloo Loan Fund
Loans up to $300 for a maximum of 90 days are available to full-time undergraduate students experiencing short-term financial difficulty.
University of Waterloo Staff Association Emergency Loan Fund
The University of Waterloo Staff Association has established an emergency loan fund for full-time undergraduate students experiencing short-term financial difficulties. Preference will be given to students who are affiliated with the University of Waterloo Staff Association. Loans up to $200 for a maximum of 90 days are available.

Bruce Walker Memorial Loan Fund
This loan fund has been established by classmates of the late Bruce Walker who lost his life in an accident in 1973. The fund represents contributions received from classmates. Loans are made available to Kinesiology students. Maximum loans are $100 with repayment within 90 days.

Women’s Auxiliary to the Optometrical Association of Ontario Loan Fund
This fund has been established by the Auxiliary to provide interest-free short-term loans to all eligible full-time Optometry students at the University who are experiencing temporary financial difficulty.

Government Assistance Programs
The Ontario Student Assistance Program (OSAP) provides various types of assistance based on financial need to eligible students. This assistance is intended to supplement, not to replace, the resources of students and their families. Although assistance is not based on academic standing, students are expected to make satisfactory progress in their studies.

OSAP consists of the following five plans:

1. Under the Ontario Study Grant Plan, Ontario students may apply for non-repayable grant assistance without having to borrow money first.
2. The Canada Student Loans Plan provides assistance in the form of interest-free loans to students who wish to pursue post-secondary studies who are not eligible for any, or sufficient, grant assistance.
3. The Ontario Student Loans Plan makes interest-free loan assistance available to students whose needs are not fully met by the Ontario Study Grant Plan and the Canada Student Loans Plan.
4. The Ontario Special Bursary Plan provides assistance based on financial need to students taking 40% or less of a normal full course load. This Plan is intended for individuals who are unemployed, receiving social assistance or have a low family income.
5. The Ontario Work-Study Plan establishes a means whereby students can actively finance the cost of their education through part-time employment on campus thus lessening their dependence on loan funding. Positions are posted outside the Student Awards Office.

Awards and Financial Aid
University Loan Funds
Government Assistance Programs
Canada Student Loans Program

Students must apply no later than July 1, and preferably earlier, to know the amount of award before classes start in the Fall; Nov. 1 for classes that start in the Winter; and March 1 for classes that start in the Spring.

Canada Student Loans Program

Part-Time Loans Plan
Guaranteed loans for part-time students attending post-secondary courses are now available under a program funded by the Government of Canada and administered by the provincial governments. Interest-bearing loans will be provided to qualifying needy students for tuition, books, transportation, day care and incidentals.

Further details and application forms for the above are available in the Student Awards Office.

Note:
Students from provinces other than Ontario should approach the provincial assistance authority in their home provinces concerning the possibility of assistance from that source. Applications and/or addresses are available from the Student Awards Office, Needles Hall.
The Department of Co-operative Education and Career Services

Browsing at the Co-operative education display, Campus Day '90.
Co-operative Education and Career Services

Director
J.C. Wilson, BScCE (New Brunswick), PEng

Program Administrators
T.H. Fitzgerald, BA (St. Lawrence)
W.B. Fuller, BA (Western Ontario)
J.W. Hoag, BArch (Toronto), FRAIC
K.B. Kennning, BA (Wilfrid Laurier)
R.A. Klawitter, BA (Western Ontario), CIM
M.A. McMartin, BA (Western Ontario)
R.A. Pullin, BSA (Toronto)
J.F. Westlake, BASc, MASc, PhD (Waterloo), PEng

Operations Administrator
D.N. Thomas, BSc (Guelph), MBA (McMaster)

Co-ordinators, Co-operative Education
S. Ahsan, BArch (Punjab), MArch (Michigan)
R.S. Barr, BMath (Waterloo)
D.J. Beaupré, BComm (Loyola), CA
L.R. Bricker, BSc, MSc (Waterloo)
N.K.M. Chiang, BA (York), MEd (Hong Kong)
W.G. Dailey, BArch (Liverpool)
S.W. Davis, BES, MA (Waterloo)
G.G. Ellsworth, AB Geol (Princeton)
M.E. Flett, BE (Technical University of Nova Scotia)
R.A. Grant, BSc (Queen's), PEng
D.S. Harris, BEng (McGill), PEng
J.C. Henshaw, BASc (Toronto), PEng
J.W. Holland, BASc (Toronto), MBA (Western Ontario), PEng
C.E. Jenkins, BA (Western Ontario)
R. Louw, BSc (Toronto)
J. Martin, BA (Windsor), CHRP
R. Mateyk, BASc (Toronto), PEng
P.J. Mazzei, BSc, MSc (Queen's), PEng
W.B. Moore, BA (McGill)
G.C. Murphy, PEng
R. Parker, BSc (Montreal), MBA (Toronto)
L.I. Pinaud, BSc, MSc (Queen's)
A.M. Prins, BA (McMaster)
R.H. Roach, BSc (Waterloo)
C.D.J. Ross, BA, MA (Wilfrid Laurier)
P. Schrader, BA (Waterloo)
V.E. Sparrow, BA (Waterloo)
I.A. Wright, BA (Waterloo)

Special Projects Co-ordinator
I.A. Lebold, BA (Waterloo)

Liaison Co-ordinator
O.F. Naese, BA (Waterloo)

Placement Advisors
A.F.H. Bieth
R.A. Hawes, BRE (Emmanuel)
J.L. Metz
B.A. Robertson, BA (Toronto)

The Co-operative Education unit of the Department is responsible for the work-term aspect of all Co-operative programs. The staff includes professional personnel who have extensive business and industrial experience.

The Co-operative Plan
Co-operative education is based on the principle that during the undergraduate years an academic program combined with integrated work experience in alternating terms, is relevant to, and desirable for, effective professional preparation. The work terms allow the student to acquire experience in the area of career interest, while the academic terms can more properly be devoted to fundamental and theoretical studies. The practical experience is in no sense a substitute for, but is rather a complement to, the academic studies.

The motivation, responsibility and opportunity for insight gained through Co-operative education can be of significant value to the student's future. The Co-operative concept enables those with a career orientation to become full-time students of their subject, both during the academic terms and during the related work terms, within a structure of organized purpose and serious study.

Operation of the Plan
Necessary arrangements for integrating work terms, securing potential employers, arranging interviews, and generally managing the employment process are the responsibilities of the Co-operative Education unit. Co-ordinators counsel students, visit them on the job, assist them to adjust to work situations and encourage their professional development.

The Work/Study Sequence
All Year: One students enrol in September and spend the first term together at the University. In some programs, the class is split into two approximately equal groups, one known as Stream 3, the other as Stream 4. Both groups receive the same total time on campus and at work. Stream 3 has a double academic term at the start of the course; Stream 4 has a double academic term at the end of the course. Other programs provide several academic/work term sequences as shown on pages 53 and 54. Variations may be requested due to academic or work situations in upper years. The dates for the beginning and end of academic terms are shown in the Academic Calendar. Precise start and finish dates for work terms are established in consultation with Co-operative employers.
# Co-operative Education and Career Services

## Work/Study Sequence

**Note:**
- The letters A and B denote academic terms.
- * denotes work term.

### Program (By Faculty)

#### Applied Health Sciences
- Health Studies, Kinesiology, Recreation and Leisure Studies

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#### Applied Studies with Honours in Other Fields
- French, Teaching Specialization

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#### Accountancy Studies
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- Chartered Accountancy Studies: Stream 5

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#### Management Accountancy Studies: Stream 3

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- Geological

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### Footnotes:
- * This term is spent at a Faculty of Education.
- ** Teaching work term.
- U Students seeking admission must normally have satisfactorily completed two work terms in another Co-op Math program.
- V Admission occurs by January for the 28 term.
- W Although the Co-op program begins in 2A, admission occurs at the time of initial application and also following Year One.
- X Although the Co-op program begins in 2A, admission is made to the program at the time of the initial application to the University.
- Y Admission occurs after first year.
- Z Admission occurs at the time of selection of second year courses. Students cannot be admitted to Co-op in first year.

Following the 4A academic term, students may take the 4B academic term or the subsequent work term in either Jan./April or May/Aug. periods.
- ** Stream 4 only.
- † Stream 4 only.
- ‡ Optional work term.
- § MAcc program.
- † Specialization work term.
- (2B) Optional academic term.
- † Work term sequences may be altered on the basis of personal preference and/or employment conditions.
- Δ Point of admission to specialization.
# Work/Study Sequence

**Note:**
The letters A and B denote academic terms
* denotes work term

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* This term is spent at a Faculty of Education.
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U Students seeking admission must normally have satisfactorily completed two work terms in another Co-op Math program.
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+ Stream 8 only.
** Stream 4 only.
(+) Optional work term.
= MacOS program.
§ Specialization work term.
(2B) Optional academic term.
 tablespoon sequences may be altered on the basis of personal preference and/or employment conditions.
Point of admission to specialization.
Employment

Although every effort is made by the Department to find a sufficient number of work-term positions for students enrolled in all Co-op programs, no guarantee of employment can be made. The employment process is competitive and academic performance, skills, motivation, maturity, attitude, and potential will determine whether a student is offered a job. If a student is not placed by the interview process, the Department will attempt to find suitable work experience for that student.

Seeking Employment and Employer Interviews

Seeking Employment

Students are expected to seek employment through the interview process arranged by the Department of Co-operative Education and Career Services. Students may not seek employment directly with a Co-operative employer unless specific arrangements are made with the Department. Students who wish to arrange their own work term assignment must have the position evaluated by the Department before it may be considered for credit. Students intending to find their own jobs may not take part in the normal application and interview process arranged by the Department. Noncompliance with the above may result in a student being placed "On Own - University Imposed".

Initial Job Application

The maximum number of initial job applications allowed may vary from time to time, depending on the number of job opportunities and students seeking employment. The maximum number will be published in the "Want Ads" and specified during the orientation program.

Re-posting and Late Posting

Students may apply for a specified maximum number of additional interviews with employers who submit their job descriptions late, as well as with employers who receive limited response to their initial advertisement.

Release of Information

For those students seeking employment through the interview process, copies of their Co-operative Student Record, academic grades and resumés are made available to prospective employers. A file which includes the Co-operative Student Record, mark reports, "Employer Evaluation of Co-operative Student" forms, records of Co-ordinator interviews, etc., is kept on each Co-operative student. This confidential file is made available for examination upon the student's proof of identification. No information may be removed from the file. Copies of "Employer Evaluation of Co-operative Student" forms will be released only upon written authorization from the employer, as this form is considered to be an extension of the employer's file.

Co-operative Education and Career Services

Seeking Employment and Employer Interviews

Work Terms

Missing Interviews

Students are expected to attend all individual interviews granted to them. Students who anticipate missing an interview for just cause should inform the Department immediately so other arrangements can be made. Students who miss interviews without just cause may be withdrawn from the placement program and placed "On Own - University Imposed".

Ranking Employers

Students are required to rank all employers by whom they are interviewed. Ranking an employer indicates an agreement to work with that employer if placed there on the placement program. Refusal to accept the job will normally be recorded on the Co-operative Student Record as: "Failed work term - refusal to honour previous agreement".

Deleted Job Choices

The deletion of a job choice will be considered when the student consults with the appropriate Co-ordinator or Program Administrator. Failure to obtain the approval for a ranking deletion may result in the student being placed "On Own - University Imposed".

Acceptance of Employment

When students are placed, they are notified to sign an "Acceptance of Employment" form, signifying their knowledge of having a two work-term commitment with an employer.

Letter of Acceptance

Each student is expected to write a letter of acceptance to the employer following notification of placement.

Work Terms

Quantity

Upon entry to a Co-op program a student is expected to follow the work-term/academic-term sequence appropriate for that particular program. A student may, for one reason or another, fail to satisfactorily complete the full complement of work terms. For these students and for students given advanced admission to a Co-op program, a certain minimum number of satisfactory work term months must be completed before graduation, namely, a number of work term/months equal to, or greater than, half the number of academic term/months in the program from the time the program begins. In those Faculties which offer both Regular and Co-operative programs, the minimum number of related work terms required for a Co-operative degree is normally four. In those Faculties offering only the Co-operative program, the minimum number of work terms normally equals the number of work terms available and remaining to the student in the program from his/her point of entry.
Allowance can be made for personal considerations, educational opportunities, and other “On Own” conditions with prior approval from the Department of Co-operative Education and Career Services. However, “On Own” conditions do not count toward the minimum requirements for graduation.

Performance Evaluation
Evaluation grades are recorded on the “Employer Evaluation of Co-operative Student” form or a special form developed in conjunction with a professional licensing body. The student should ensure that the employer has sent a completed evaluation to the University.

Academic Record for a Student Enrolled in a Co-operative Program
The Student Examination Report for the student’s last academic term will be sent to the Co-operative employer unless the student notifies the Department of Co-operative Education and Career Services to the contrary prior to the commencement of each work term.

Failure to Report to Employer
Failure to report to an employer will be recorded on the Co-operative Student Record as “Failed work term—refusal to honour previous agreement”. Withdrawal from the program may also be required.

Leaving Employer Without Prior Approval
Terminating employment without prior approval from the Department of Co-operative Education and Career Services may result in the Co-operative Student Record having the notation “Failed work term—terminating employment without prior approval”. Withdrawal from the program may also be required.

 Strikes
It is each individual student’s responsibility to decide whether or not to cross a picket line in the case of a strike. The role of the Co-ordinator in this situation is to inform the student of the potential results of either decision.

Dismissal With Cause
Dismissal of a student by an employer will be investigated by the student’s Co-ordinator and will normally be recorded on the Co-operative Student Record as “Failed work term—dismissed with cause”.

Commitment
A minimum of two consecutive work terms with an employer is expected. Provision is, however, allowed for such situations as one-term jobs and economic uncertainty. In all cases, failure to obtain approval from the appropriate Co-ordinator to not return for a second consecutive work term will normally be recorded on the Co-operative Student Record as “Failed work term—refusal to honour previous agreement”.

Unsatisfactory Performance
Unsatisfactory performance by a student on a work term is investigated by the student’s Co-ordinator. If benefits from further professional training are questionable, the student may be required to withdraw from the program.

On Own
This condition, as recorded on the Co-operative Student Record, does not count towards the minimum requirements for graduation. This terminology is used to denote the following conditions:

- On Own – Self Imposed: The student has been granted a term off by the Department of Co-operative Education and Career Services for personal reasons. This condition may be changed on the Student Record should the student find suitable employment through his/her own efforts.
- On Own – Unable to Find Suitable Employment: The student was unable to obtain suitable employment through the normal placement process. If suitable employment is subsequently found, Student Records will be altered accordingly.
- On Own – University Imposed: This notation normally indicates that a student has not complied with a program regulation or procedure. Reasons for this notation include, but are not restricted to, missing interviews without just cause and failure to discuss deleted job rankings.

Change of Term Sequence
Term sequence changes are considered by the Faculty in which the student is enrolled. Application, in the form of a letter from the student (supported by an employer and/or a Co-ordinator) must be made to the appropriate Assistant Registrar. For some Faculties, an appropriate application form must be completed. Normally the request should be made within the first two weeks of the term preceding the switch point. In addition, the student’s academic performance must be “in good standing”. It should be noted that the student’s academic program may be restricted due to lack of choice of core or elective subjects during particular terms.

Communication with the Department of Co-operative Education and Career Services
Each student is expected to maintain communication with the Department on all matters pertinent to participation in the Co-operative program. Consultation with the appropriate Co-ordinator, Program Administrator or Placement Advisor is essential where regulations and procedures for Co-operative programs are an issue. It is the student’s responsibility to ensure that his/her student file is current and correct.
Standings and Appeals
Applicable to information on pages 5:5 and 5:6. The Department of Co-operative Education and Career Services which administers these Regulations and Procedures will first present any notation of “Failed Work Term”, “On Own – University Imposed”, or “Required to Withdraw” (as a result of unsatisfactory work-term performance) to the appropriate Faculty Examinations, Promotions or Standings Committee for a decision. The student is notified by letter of the final decision made by the Committee. The decision may be appealed through the normal appeal channels within the Faculty.

Work Reports

Quantity
Normally the minimum number of satisfactory work reports required for graduation is four, the first one to be written during the first work term. Exceptions to this requirement are stated in the calendar or in the individual student’s file. Employers, as well, may require additional reports from students as part of the job. Normally for a report to be considered, it must have been written during the work term and be related to or evoked by the work-term activity.

Grading
Work reports are graded as “Outstanding”, “Very Good”, “Satisfactory”, “Unsatisfactory” (resubmit) or “Unacceptable”. Provision is made for students to upgrade “Unsatisfactory” work reports for re-evaluation by the beginning of the student’s next academic term.

Content and Format
The University provides a common set of written guidelines for all Co-operative programs. Some Faculties/Departments also provide written addenda.

Confidentiality
In programs where a faculty member or a Co-ordinator normally evaluates the report, provision may be made for the appropriate Co-ordinator or Employer to evaluate a confidential report. Some Faculties/Departments may provide more specific requirements in published addenda. Students should consult with their Co-ordinator or Program Administrator before writing a confidential work report.

Evaluator
Each program has a policy stating that work reports are evaluated and graded by either a faculty member, an Employer, a Co-ordinator or some combination of these.

Co-operative Education and Career Services

Work Reports
Graduation Requirements for Co-operative Programs

Receipt and Return
When the work report is to be evaluated by a faculty member or a Co-ordinator, the report is presented by the student to the Department of Co-operative Education and Career Services and a receipt is issued. Normally the report may be retrieved from the Faculty/Department responsible for the evaluation. Reports that are not picked up by the first week of the student’s next academic term are destroyed. If the student is in a program where the Employer evaluates and grades the report, a copy of the report must be turned in to the Department of Co-operative Education and Career Services at return-to-campus time. No copy is required if the report has been declared “confidential” by the Employer.

Graduation Requirements for Co-operative Programs

WORK TERMS

Quantity
See page 5:5.

Performance Evaluation
In those programs with a stated minimum number of work terms, this number is also the minimum number of satisfactory work terms.

In programs having no stated minimum, the required number of satisfactory work terms is one less than the number of work terms remaining in the program from point of entry, provided that the number of work terms available to the student is greater than five; otherwise all work terms must be satisfactory.

WORK REPORTS

Quantity and Grading
In most programs the submission of a minimum of four work reports graded “Satisfactory” or better is a requisite for graduation. Provision is usually made for students to upgrade unsatisfactory reports or submit new reports. Special arrangements may be considered for cases such as those for which there are less than four work terms available to the student, and other special situations which might arise.

Registration Through Final Term
All work terms must be completed before the final academic term and the last work report must be submitted no later than the beginning of the final academic term. In all Co-operative programs, students must be registered as full-time students in the program in all terms from point of entry through to the final academic term. The only exception occurs in programs on a credit system in which a student may have sufficient credits to be able to register as a part-time student in the final term, provided all full-time term requirements of the Faculty have been met.
Co-operative Degree Designation

Since Architecture and Engineering are mandatory Co-op programs, University of Waterloo graduates in those disciplines are known to have gone through the Co-operative system. In programs which can be taken on the Co-operative or Regular basis, graduates completing the Co-operative plan requirements will receive a "Co-operative" degree designation.

Waterloo Advisory Council

The Waterloo Advisory Council of the University of Waterloo was established in 1958 to bring guidance from business, government and industry to the University. The Council meets twice a year to discuss and make recommendations on items related to all aspects of the University.

W.G. Whiteside (President) 
Block Drugs Co. (Canada) Ltd.
R.T. Mahler (Past-President) 
Finning Ltd.
R.R. Mahabir (Vice-President) 
General Electric Canada
S.E. Roberts (Secretary) 
Proter & Gamble Ltd.
S.H. Conforth (Membership Chairperson) 
Price Waterhouse

Dr. M. Barrados
Auditor General

D.B. Beldam
Clarke Henning & Beldam Ltd.

N.A. Best
Best & Storey Assoc.

C.S. Boyce
3M Canada Ltd.

J. Campbell
Bell Canada

D.J. Cash
Kingston Area Economic Development Commission

S. Cheda
Ministry of Culture and Communications

P. Clark
Dow Chemical Canada Inc.

T. Corcoran
IBM Canada Ltd.

J. Crang
Crang & Boake Inc.

P. Glynn
Health and Welfare Canada

N. Hayes
Anderson Consulting

G. Heckman
Royal Bank of Canada

J.K. Hogan
Shell Canada Ltd.

Co-operative Education and Career Services

Co-operative Degree Designation
Waterloo Advisory Council
Students Advising Co-op Group; Career Services

C.J. Irwin
Bank of Montreal

B. Kemble
Union Gas Company Ltd.

S. Labarge
Office of the Superintendent of Financial Institutions

G. Munro
Imperial Oil Ltd.

I.E. Paterson
Imperial Optical Canada

D. Roberts
Solar Computers (Cambridge) Inc.

E.L.G. Rosinger

Canadian Council of Ministers of the Environment

Dr. I.H. Rowe
Spar Aerospace Ltd.

J.P. Sabourin
Canada Deposit Insurance Corp.

G. Scott
Public Service Commission

J. Shaddick
London Life Insurance Co.

W. Siegel
Longwoods Research Group Ltd.

W. Thornhill
Canada Trust

J.R. Vose
Connaught Laboratories Ltd.

J.S. Willson
The Universal Group

Students Advising Co-op Group

Students Advising Co-op Group is the formal liaison between students and the Department. The Group consists of Co-op students appointed by the various Student Societies and anyone else who wishes to join. These members advise the Department on matters of policy from the students' points of view.

Career Services

Program Administrator
T.H. Fitzgerald, BA (St. Lawrence)

Co-ordinator, Career Services
F.M. Ruszer, BA, MSc (Guelph)

Career Advisors
M. Bryan, BA (Waterloo)

L. Kling, BA (Waterloo), BEd (Western)

Career Services facilities and services are available to all UW students.
Graduating Students Interviews (GSI), NH 1001, ext. 2896
Graduating students looking for permanent employment may register in September of their final year for interviews held on campus during the Winter term. Registration for co-op students on a Fall work term is the preceding May.

Alumni Referral Service (ARS), NH 1001, ext. 2482
The year-round service is available to students within one to two months of being able to being full-time, permanent employment and to UW Alumni. To register with ARS for computer-matched jobs, individuals submit an application form and ten resumes. Apply direct immediate openings are posted on the bulletin board.

Career Preparation, NH 1001, ext. 2572
Workshops are scheduled each term to help students prepare for a career. Topics include self assessment, researching occupations, resumé and letter writing, interviewing, job search, networking and more. Advisors are available by appointment to discuss career-related concerns.

Student Career Advisors (SCA)
Students trained in the areas of career planning and job search are available as peer resource persons in the various faculty areas during the Fall and Winter. Information on office hours and locations can be obtained from the SCA Supervisor's office in Room 1004, Needles Hall or by telephoning ext. 2494.

Career Resource Centre, NH 1115, ext. 3001
Resources cover a wide range of information helpful in making occupational and educational choices, on locating employers, study or work abroad, and on self employment and alternative, non-traditional careers. In addition, Summer and part-time jobs are posted on the bulletin board.
The following is a list of employers who participated in Waterloo's Co-operative programs in 1990. The list does not acknowledge the individual departments within some of the organizations who participated.

<table>
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<th>Organization</th>
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<td>Abitibi Price Inc.</td>
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<td>Academy of Learning Skill Development Centre</td>
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<td>ACF Flexible Inc.</td>
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<td>Adult Occupational Centre</td>
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<td>A.E.G. Bovky Inc.</td>
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<td>A.J. Diamond &amp; Donald Schmitt Architects</td>
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<td>Altberg and Partners Chartered Accountants</td>
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<td>Campbell Lawless</td>
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Co-operative Education and Career Services
Organizations Employing Co-operative Students

Koster, Spinks & Koster Chartered Accountants
Leo Kraemer & Co. Ltd.
Krugler Inc.
The KTS Systems Group
Kuch & Stephenson Architects
Kyles Garratt & Marklevitz
Labatt Breweries of Canada Ltd.
John Labatt Ltd.
Labarge Canada Inc.
Laidlaw Environmental
Michael D. Laing Chartered Accountant
Lakefield District Secondary School
Lake Ontario Cement Ltd.
Lakeshore Area Multiservice Project
Lake Simcoe Enterprises Ltd.
Gail E. Lamb

Lanark County Language Behavior & Infant Development Programs
Landau Partnership Architects
Langhorne Lynch Lilloo
Lanworks Inc.
William Larkin Architect
Lavallin Inc.
Lavenhol & Horwath
Lazossi Associates Architects
Leber/Rubes Inc.
Leblanc & Roy Telecom Inc.
Leeds-Grenville County Board of Education
Lehman and Associates Planning Consultants
Leitch Video Ltd.
Lennox Industries (Canada) Ltd.
Leonardo Da Vinci Academy
Lett Smith
Lever Brothers Ltd.
Leviton
LGS Group Inc. Consultants
Liburdy Engineering
Martin Lieffebber
Lighting Sciences
Linamar Machino Ltd.
Lincoln Electric Co. of Canada Ltd.
Lingwood/Dupej Architects
Linkage Inc.
Thomas J. Lipton Inc.
Upton Wiseman Albaun & Partners
Liquor Control Board of Ontario
Liton Systems Canada Ltd.
Live Wire
Lloyds Bank of Canada
Loblaw Companies Ltd.
Loeb Inc.
Loewen Ondaatje McCutcheon & Co. Ltd.
London Housing Authority
London Life Insurance Co.
London Regional Cancer Centre
London Rehabilitation Service
London Transit Commission
W.P. London & Associates Ltd.
Long Manufacturing Ltd.
Longyear Canada Inc.
Lorik Tools
Lorne Park Secondary School
Lexus Development Canada Ltd.
Michael E. Lundholm Architect
Lura Group Environmental Management
Lynx Geosystems Inc.
Mac Industries Inc.
MacLean Hunter Ltd.
MacLennan Associates Architects
MacMillan Bloedel Ltd.
MacSkimming Outdoor Education Centre
Madgeett & Partners
Magic Pantry Foods Inc.
Maglan Plastics Inc.
Mahlu, Nolais, Collins, Barrow
Chartered Accountants
Malone Given Parsons Ltd.
Management of Technology & Innovation
Manalta Coal Ltd.
Manohorost Plastics Inc.
Mandelbaum Rosenberg & Gluckman
W.F. Mann Planning Ltd.
Manson Insulation Inc.
The Manufacturers Life Insurance Co.
Maple Leaf Monarch Co.
Maplewood Computing Ltd.
Mark Musselman McIntyre Combe
Markson Skolink Inc.
Marshal Fisher Architects
Marshall Macklin Monaghan Ltd.
Alan G. Martin Chartered Accountant
Martin E. Segal Company Ltd.
Martin Pet Foods
Mathers & Haldenby Architects
Matsen Driscoll & Darnico Ltd.
Mattel Canada Ltd.
Maxim Alarms Ltd.
Mayfield Secondary School
McCallum Brodeur Chartered Accountants
McColl-Frontenac Inc.
McColl Turner & Co.
McConnell Maughan Ltd.
McCormick Rankin & Associates Ltd.
N. McDonald Architect Inc.
McElhanney Engineering Services Ltd.
McKerlie-Milen Inc.
McKinlay Transport
McKinsey & Co.
McLean Capin & Jamieson Chartered Accountants
McMaster University Medical Centre
McMichael Canadian Art Collection
S. McNally & Sons Ltd.
McNeil Consumer Product Co.
McQuest Marine Research & Development Co. Ltd.
MCW Consultants Ltd.
MDS Health Group Ltd.
MDS Laboratories Ltd.
Meadowvale Secondary School
Medcraft Parsonson
Megel Systems Computer Consultants
Mekinda Snyder Weis Architects
Memorial University of Newfoundland
Mensaco Aerospace Ltd.
Mental Health Centre
Mercantile & General Reinsurance Group
William M. Mercer Ltd.
Merrck Finess Laboratories
Merrif Dow Pharmaceuticals (Canada) Inc.
Merrill Lynch Canada Inc.
Metro Central YMCA
Metropolitan Life Insurance Co.
Metropolitan Toronto Police
Metroplis Trust
Metro Taxation Consultants
Metro Toronto Association for Community Living
Microsoft Corp.
Midwestern Regional Centre
Miles Canada Inc.
Millard Rouse & Rosebrugh
Miller Odell Planning Consultants
J.C. Milne Construction Co.

Minnova Inc.
Minotaur Software
Mintz & Partners
Mirtone
Mitsui Corporation
Mitsubishi Electronics
MLH & A. Inc.
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Monopros Ltd.
Monrose Auto Equipment Co.
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Monteith Ingram Graham Ltd.
Monteith Zelinka Ltd. Urban & Regional Planning
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Moore Instruments Ltd.
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Mosalc Inc.
Motorola Canada Ltd.
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M.P.B. Technologies Inc.
MPH Consulting Ltd.
MPR Teltech Ltd.
M.R.C. Alarms
MTD Products Ltd.
Multi Health Systems Inc.
Multilin Inc.
Municipality of Metropolitan Toronto
Muskoka Centre
The Mutual Group
Nabisco Brands Canada Ltd.
Nacan Products/Lepages Ltd.
David Nairne & Associates Ltd.
Nasello Francella & Krishna Chartered Accountants
National Capital Commission
National Coupling Ltd.
National Institute of Magnetism Technology
National Research Council
National Silicates Ltd.
National Slag Ltd.
National-Standard
Navtel Canada Inc.
NCR Canada Ltd.
Neele Staniszkis Doll Architects
Neinstein Birnbaum Wiseman
Nells Inc.
Nelson Canada
Nelson Monuments Ltd.
Nestle Enterprises Ltd.
Netron Inc.
Newbridge Communication Networks Corp.
New Liskeard College of Agricultural Technology
Niagara View Real Estate
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<th>Organization Name</th>
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<td>North American Life Assurance Co.</td>
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<td>Northern Digital Inc.</td>
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<td>Northern Pigment Co. Ltd.</td>
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<td>Northern Telecom Ltd.</td>
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<td>Office of the Provincial Auditor, Ontario</td>
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<td>Ontario Laser &amp; Lightweight Research Centre</td>
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<td>Ontario Municipal Employees Retirement Service</td>
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<td>Open Text Systems Inc.</td>
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<td>Opera Hamilton</td>
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<td>Optikom Ltd.</td>
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<td>Oracle Corp.</td>
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<td>Orchard Automation Group Inc.</td>
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<td>Orland Brass &amp; Malinsky Chartered Accounts</td>
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<td>The Jim Pattison Sign Co.</td>
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Co-operative Education and Career Services
Organizations Employing Co-operative Students

Reuters
Richardson Foods Ltd.
Richardson Hill Hydro
Richter Usher & Vineberg
Rideau Regional Centre
Rimply MFG (Decora International)
Ridoran Ski & Sport Centre
Road Scholar
Robbie Architects Inc.
Robert Land Academy
Robertson-Whitehouse
Robinson Lott & Brohman
R.G. Robinson & Associates
Rogers Cable TV
Rogers Cantel Inc.
Rogers Data Service Inc.
Rohm & Haas Canada Ltd.
Rolf Jensen & Associates Ltd.
Rolls Royce Canada Ltd.
Rosenberg Sacks & Smith Chartered Accountants
Rosenswig Singer Carrere & Applebaum Chartered Accountants
Peter Rose Architect
Rose Technology Group Ltd.
Ross Pope & Co.
S.L. Ross Environmental Research Ltd.
Rosenberg & Hochman Chartered Accountants
Roth-Knibb Architects
Rowan Williams Davies & Irwin Inc.
Rowntree MacKintosh Canada Ltd.
Royal Bank of Canada
Royal Canadian Mounted Police
Royal LePage
Royal Military College of Canada
Royal Ottawa Hospital
Royal Trust
RPA Consultants Ltd.
RPR Consultants
Rubbermaid (Canada) Ltd.
B. Scorey Consultants
Scott Associates Architects
Scott Rankin
Scott's Hospitality
Scors Canada Inc.
Secan Association
Securex International
Securiplex Systems
Seleclone Paints Ltd.
Semiconductor Insights Inc.
Seneca College King Campus
Sensor/B.M. Hi-Tech Inc.
G.M. Sierras & Associates Ltd.
Shawarwe Inc.
Shelton Centre for Outdoor Education
Shell Canada Ltd.
Sheridan Geophysics Ltd.
Sherman Supersonic Industries
Shille & Sutton Chartered Accountants
Shimmerman Penn Becker Chartered Accountants
Ships Co. Theatre
SHL Systemhouse Inc.
Shore Tile Irwin Peters
R.G. Shugg Engineering Ltd.
Siemens Automotive Ltd.
Silverdale Computers Inc.
Silver Lake Mennonite Camp
Simcoe County Board of Education
H.A. Simons Ltd.
Sims Moelich Associates Ltd.
Ski Esprit
Skyline Hotel
Smith Lyons Terrance Stevenson & Mayer
Smith Nixon & Co.
Snider Reichard & March Architects
Snow Valley Resort
Soubozo Group Inc.
Soberman Isenbaum & Colombo
Software Concepts
The Software Group
Software Kinetics Ltd.
Fichter Solfarman Architects
Soil Probe Ltd.
Solarcham Enterprises Inc.
Solar Computers (Cambridge) Ltd.
Soloria Research Enterprises
Soma Office Systems
Somaplo Ltd.
Joe Somfay Architect
Sopol of Canada Ltd.
Southam Business Publications Ltd.
Southam ITM
Southwestern Regional Centre
Spar Aerospace Ltd.
Michael Spanzian Architect
Spectrum Engineering
Speddy Muffler King
Spicer Computer Developments
Spicer Corp.
The Sports Clubs of Canada
Springer & Lucas
Spring Lake RV Park Ltd.
Sprucedale Youth Centre
Spruce Lodge
Squire D Canada
Stackpole Ltd.
Stadium Corp. of Ontario Ltd.
Stamm Economic Research
Standard Biological Laboratories Ltd.
Standard Tube Canada Inc.
Stark Hicks Spragg Architects
Starkman Kraft Rothman Raper & Grill
Chartered Accountants
Staples Inc.
St. Clair College of Applied Arts & Technology
Stelura Nichols Yallonge Associates Architects
Stelco Inc.
Sterile Pharmaceuticals Ltd.
Sterling Inc.
Stirling Software Int'l Inc.
Stern Cohen Weinstein Baines
Stern Labs Inc.
Stevens & Burgess Associates Architects
Stevenson & Lethock Chartered Accountants
St. Joseph's Health Centre
St. Lawrence Centre
St. Lawrence Seaway
St. Michael's Hospital
St. Mildred's Lighthouse
STM Systems Corp.
R.L. Stollar & Associates
Storage Plus
Strains Ltd.
Strathcona Mineral Services Ltd.
Streetville Secondary School
Strohn Systems Inc.
Sudbury General Hospital
Sunbear Lodge
Sunhor Inc. Sunnoco Group
Sun Life Assurance Co. of Canada
Sunnybrook Medical Centre
Surgikos Ltd.
Dermot J. Sweeny Architect Inc.
Swiss Bank Corporation (Canada)
Syracuse Canada Ltd.
Syrnologic Inc.
Syntex Ltd.
H. Tam & Associates Chartered Accountants
Tamrock Canada Inc.
Tamwood Lodge
Tandem Computers Canada Ltd.
Tapestry Music Theatre
C.C. Tatham & Associates Consulting Engineers
Taxbase Systems Inc.
Taxprep Information Systems Inc.
Tax Time Services
Taylor Leibow
Technical Service Laboratories
Teck Corinona Operating Corp.
Tectrol Inc.
Teklogix Ltd.
Tektron Equipment Corp.
Teledirect Publications Inc.
Tele-Direct Systems
Telemedias Results Group
Tolonoide-Sage Ltd.
Tesalat Canada
Telseystems SLW Inc.
Tembec Inc.
Alexander Temporale & Associates Architects
Terraprobe Ltd.
Tescon TES Contract Services
Textware Technical Communications
Theatre Ontario
Paul Theil Associates Ltd.
Theratek International Inc.
Theratek International Inc.
Thomas A. Stewart Secondary School
Thomas Blood Architect
Thompson Gordon Ltd.
Tilbury & District Community Centre Board
Tillinghast Level 14 MLC Centre
Discussing class assignments at an entrance to the Davis Centre Library.
The University Library

University Librarian
M. C. Shepherd, BEd (Saskatchewan), MA (LS) (Denver)

Associate Librarian, Systems
TBA

Co-ordinator, Library Administrative Services
L. Beattie, BA (Loyola of Montreal), MA, PhD (Waterloo)

Library Development Officer
M. Stanley, BA (Waterloo)

Special Collections Librarian
S. Bellingham, BA (Waterloo Lutheran), MLS (Western Ontario)

Librarian
R. Lamb, BA (Guelph), MLS (Western Ontario)

Business Administrator
J. Jorgensen, BA (Toronto)

Collections Division

Associate Librarian, Collections
C. D. Emery, BA (Durham), MPhil (Cranfield), ALA

Head, Cataloguing Department
W. Oldfield, BA (Waterloo Lutheran), MLS (Western Ontario)

Cataloguers (Cataloguing Department)
H. Calogeridis, BA, MLS (McGill)
Y. Gordon, BA (Manitoba), BLS (Toronto)
L. Helfand, BSc (York), MLS (Western Ontario)
L. Teather, BA, MLS (British Columbia)
M. Wan, BSc (Hong Kong), BMath (Waterloo), MA, MLS (Western Ontario)

Head, Materials Acquisition Department
B. Bruder, BA (Waterloo Lutheran)

Cataloguers (Materials Acquisition Department)
T. Canini, BA, MA (Helsinki), MLS (Western Ontario)
J. Kuhn, BA, MA (Creighton), MLS (Western Ontario)

Co-ordinator, Collections Management
S. MacKinnon, BA (Mount Allison), BLS (McGill)

Public Services Division

Associate Librarian, Public Services
B. MacNeil, BSc (Laurentian), MLS (McGill)

Co-ordinator, User Education
M. Hendley, BA (College of New Rochelle, N.Y.), MLS (Western Ontario)

Co-ordinator, User Services
S. Routliffe, BA (Carleton), MLS (Western Ontario)

University Map Librarian
R. Pinnell, BSc (Toronto), MSc, MLS (Western Ontario)

Cataloguer (University Map and Design Library)
A. Chan, BA (Hong Kong), MLS (Western Ontario)

Co-ordinator, Information Services
TBA

Head, Porter Reference & Collections Development Department
TBA

Reference & Collections Development Librarians (Porter)
M. Aquan-Yuen, BA, MLS (Toronto), MA (Waterloo)
M. Blok, BA (Waterloo), MLS (Western Ontario)
R. Crusz, BA (Ceylon), BLS (Toronto), MA (Waterloo)
M. Ferguson, BA, MA (Waterloo), MLS (Western Ontario)
D. Fitzpatrick, BA, MA (Windsor), MLS (Toronto)
C. Jewell, BA (C.W. Post College of Long Island University), MA, MLS (Toronto)
A. Lakos, BA (Jerusalem), MLS (British Columbia)
S. Moskal, BSc, (Wisconsin-Madison), MLS (Western Ontario)
E. Murphy, BA (St. Mary's), MLS (Dalhousie)
S. Rahman, BA, MA (Punjab), MA (Waterloo), MLS (Indiana)
M. Sawchuk, BA, BEd, MLS (Western Ontario)

Head, Davis Reference & Collections Development Department
J. Macdonald, BSc, BEd (Dalhousie), MLS (Western Ontario)

Reference & Collections Development Librarians (Davis)
J. Cooper, BEng (Technical University of Nova Scotia), MLS (Toronto)
J. Cummings, AB, MLS (California, Berkeley)
W. Macpherson, BSc, MLS (Dalhousie)
A. McKay, BEng (McGill), MLS (Dalhousie)
J. Parrott, BSc (Queen's), MSc, MLS (Toronto)
C. Stephenson, BSc (Guelph), MLS (Western Ontario)

Co-ordinator, Industrial and Business Information Service
F. Abrams, BA (Sir George Williams), MLS (McGill)

Co-ordinator, Machine Assisted Reference Service
D. Morton, BSc, MLS (Western Ontario)

Co-ordinator, UW Press
G. Smith, ARCT (Toronto), BA (McMaster)
The University Library

The Library is central to the academic programs of the University. Its function is to provide books, journals, and other library materials to support these programs. The library staff, aided by the university community, works to make the library a base for teaching, study and research. The University Library is composed of two divisional libraries, the Dana Porter Library, and the Davis Centre Library; one branch library, the University Map and Design Library; and one reading room, the Optometry Learning Resource Centre.

The ten storey Dana Porter Library is situated in the centre of the campus. The lower floors house the main public services and support services. Public services located on the first floor include a large Reserve Reading Room with seating for 100 readers, the Doris Lewis Rare Book Room, the microform collection, and eight typing cubicles. The second or main floor contains the Circulation Counter and the Information Desk. Also on the main floor the Interlibrary Loan Office, the Copy Centre and the Reference Collection. The periodical collection is located on the third floor. Government publications are located on the fifth floor. Catalogue terminals are located on each floor with a bank of terminals located on the 2nd floor. Floors six through ten house the circulating book collection and contain seating accommodation for more than 700 library users.

The Dana Porter Library houses collections to support programs in the social sciences and humanities. The collection numbers over 1,700,000 items including books, pamphlets, theses, microforms, documents, reports, sound recordings and other material. The Library subscribes to over 5,900 serials and over 50 newspapers.

The Davis Centre Library is located on the main floor of the William G. Davis Computer Research Centre. The three principal public areas - the Catalogue, the Circulation and Information Desks - are visible from the entrance to the Library. Seating is provided for 800 readers.

The Davis Centre Library collection numbers over 400,000 items including books, microforms, government publications, technical reports and maps. The Library subscribes to over 4,500 current serials.

The University Map and Design Library is located on the main floor of the Environmental Studies I Building. It is the principal centre on campus for the provision of service relating to cartographic and architectural design materials. The collection consists of more than 124,000 items including maps, air photographs, books, theses, and periodicals.

The Optometry Learning Resource Centre contains the Library's collection in the field of optometry.

The Library uses an on-line circulation control system to record the loan of material to library borrowers. The system has enabled the Library to speed up the circulation process and to display a variety of information to the borrower.

WATCAT, the online catalogue, is the central record of the library's catalogued holdings. WATCAT may be searched from any terminal in the library, elsewhere on campus or from any location off campus using a terminal and a modem.

The Library provides a Machine Assisted Reference Service (WATMARS) which is a quick and efficient method of searching databases by computer. The charge for this service depends on the database being searched, the amount of time required to conduct the search and the number of references obtained.

Special services including microcomputers with voice output, large print readers, a brailler and four-track cassette recorder and playback units are available for the visually handicapped. Two rooms in the Dana Porter Library are available for use by the visually handicapped and their readers. The Library can also provide access to talking book material through the W. Ross Macdonald School, Brantford. TDD equipment is located at the information desks in both the Porter and Davis Libraries and at the telephone renewal line to serve the needs of the hearing impaired. All libraries are accessible by wheelchair.

The Federated and Affiliated colleges (St. Jerome's, Conrad Grebel, and Renison) have their own libraries which are accessible to University of Waterloo students, staff, and faculty. Conrad Grebel College Library has over 30,000 items which include a special collection on Peace Studies and a large current Music collection. It is the home of a Mennonite Library Archive which consists of church records and documents of the Mennonites of Ontario. The St. Jerome's Library is located in the College's main classroom building and houses a collection of approximately 35,000 volumes which reflect the courses taught at St. Jerome's. Most items are now accessible through WATCAT. The 10,000 volumes in the Renison Library serve the College's Social Development Studies Program and its courses in East Asian Studies and General Arts. A small section deals with Anglican theology.

The University of Waterloo, Wilfrid Laurier University, York University, the University of Western Ontario, Brock University and the University of Guelph Libraries have reciprocal borrowing agreements which allow students, faculty and staff of one institution to borrow monographs from the other Libraries. Wilfrid Laurier University's collection is particularly strong in the fields of Christian Religion, Business, Social Work, and Music. The University of Guelph has large holdings in
Agricultural Science, Family and Consumer Studies, Communications, Landscape Architecture and Veterinary Medicine. Collection strengths at York include Social Sciences (especially Canadian History, Psychology and Sociology), Literature, Fine Arts (principally twentieth century, but some strength in the nineteenth century), Physical Education and Law. The University of Western Ontario has strong holdings in Law, Medicine, Education and Canadiana.

The staff of the University Library is engaged in obtaining material, processing it for the collections, and providing access to the collections. During the day and evening, reference and user services staff are on duty to assist in the use of collections, facilities and services. The libraries remain open after reference and user services close.

Service to the business and industry community is provided through the Library's Industrial and Business Information Service (IBIS). The Service draws on the collections at Waterloo and other institutions, including hundreds of databases around the world. The Service, available for a fee, can be used in person, by phone, mail, or electronic system.

The Library Handbook is available in all the libraries. It explains the use of the libraries, the catalogue (WATCAT), the serials list and general rules and procedures. Also available are other publications, such as bibliographies and guides to using the collection.

The University Library offers a full range of orientation and instructional services designed to introduce users to the Library and to assist them in their use of library resources. Ranging in scope from introductory tours to term-paper strategy sessions, these services are available at scheduled times and upon request throughout the year.
Computing Services on Campus

A student using a SUN workstation.
Computing Services on Campus

DEPARTMENT OF COMPUTING SERVICES

Director
P.H. Dirksen, BSc, MA (Waterloo)

Associate Directors
J.P. Sprung, BASc (Toronto), MA (Waterloo)
- Operations
B.E. Uttley, BMath (Waterloo)
- Systems and Development
R.W. Watt, BSc, MMath (Waterloo)
- Distributed Computing

The Department of Computing Services (DCS) provides user-support services and maintains and operates the University's central computing and networking facilities. These facilities are used for instruction, research, and administrative use throughout the campus, to augment facilities provided in the faculties and departments. Depending on the requirements of the academic course or research project, professors or supervisors may choose from a variety of central-facility computing environments for students to use:

UNIX: WATSERVI, a large multi-user Sun SPARCserver 390 computing system, plus WATSHINE, a lab room of SUN 3/50 workstations.

VM/CMS: WATDCS, a large multi-user complex of IBM 4381 and 4341 computers, plus a lab room of IBM 3270 terminals.

PC/DOS: several lab rooms of IBM PS/2s and PCs connected in "JANET" networks.

WATSERVI, WATSHINE, and WATDCS are connected to the university computer network, which has links to wider-area networks connecting academic institutions across the country and around the world. They are also connected to the university terminal-access communications facility (SYTEK), which can be accessed from home via local telephone calls in the Kitchener/Waterloo area or nationally and internationally via Telecom Canada's "DATAPAC".

If students wish to use DCS-provided computing facilities for purposes beyond immediate academic course or research-project requirements, it is possible to obtain a computer userid for any of the above facilities by arranging payment with their own funds. Also, there is a network of Apple Macintosh computers and a network of IBM PCs for which students can obtain a userid for a small monthly charge; both have access to a "pay-per-page" LaserWriter printer for producing high-quality documents.

DCS's Education and Consulting group provides a variety of user-support services, available without charge to all members of the university community:

DCS Courses: a program of presentations and hands-on workshops providing instruction in the use of applications software, programming languages, and personal-workstation and multi-user computing systems that are widely in use throughout the University.

Technology Resource Centre [MC 2015]: computing-system documentation; industry trade magazines; freeware file servers containing PC and Macintosh software for those who wish to copy software for use on their workstations.

Data Resource Centre [MC 2020]: reference documents and machine-readable datafiles collected from numerous Canadian and international surveys and studies.

Consulting Offices [E2 2349A, ES2-190A, HH 243, BMH 301]: to help resolve difficulties encountered in the process of using a computer.

For more information, contact the Distributed Computing Secretary, MC 2031, ext. 3271.

UW COMPUTER STORE (MC 2018)

Manager
J.W. Dodd, BASc (Toronto), MSc (Waterloo)

The Store houses demonstration units of personal workstations from Apple, IBM, Zenith, and Amstrad, with widely-used applications software for IBM PS/2s, PC-compatibles, and Macintosh workstations, a hardware/software sales centre. A guaranteed loan program is available.

APPLIED HEALTH SCIENCES FACULTY COMPUTING

Associate Dean for Computing and Special Projects
R.P. Wells, BSc (Manchester), MEng (McMaster), PhD (Manchester)

Computing Consultant
T.O. Stewart, BA, MA (Waterloo)

The Faculty of Applied Health Sciences makes computing available to undergraduate students in a variety of ways. A 20 workstation JANET network is provided in B.C. Matthews Hall. Many courses are supplemented by commercial and custom software accessible on this network. Up-to-date word processing software are also provided on this network for undergraduate word processing needs. In a few courses, the IBM mainframe network is the vehicle for instructional computing.

Specialized computers and lab equipment are available to undergraduates for use in collecting and analyzing data for their own course and research work. For example, the WatScope system converts analog measurements to digital data for time-series and other analysis; the WatSmart system collects data in three-dimensional space for use in the study of human movement.
In addition to regular full-time staff, WATSTAR also employs a part-time Co-op student each term who is available during scheduled hours for consulting purposes. As consulting times vary each term, students are advised to contact the WATSTAR office directly for up-to-date times (ext. 2965).

ENGINEERING EDUCATION RESEARCH CENTRE
Associate Dean for Computing, Faculty of Engineering
W.J. Wilson, BE, MSc (Saskatchewan), PhD (Cambridge), PEng

The Engineering Education Research Centre (EERC) is concerned with improving the quality of undergraduate education, particularly through the use of appropriate information technology. The Centre coordinates a variety of special projects, as well as creating and managing new educational computing facilities.

EERC staff works on projects with faculty and students, exploring innovative ways to help teaching and learning in a number of subject areas. These include: symbolic computation, system simulation, CAD/CAM, computer graphics, image processing, circuit simulation, educational software evaluation and creation, usability, user interface design, and technical documenting.

The Centre manages Project BEACON, a lab containing engineering microVAX workstations with high-resolution graphics used for teaching and design projects. The EERC also runs a network of Macintosh computer systems for general use by students, and the Project LIBRA Lab, a Macintosh facility recently created for teaching and project work.

ENVIRONMENTAL STUDIES: MAPPING, ANALYSIS AND DESIGN COMPUTING

The Mapping, Analysis and Design (MAD) facility provides a wide range of computing and consulting support for students, faculty and staff in Environmental Studies. Students have access to basic and advanced computing equipment, as required by their studies.

MAD supports two Macintosh microcomputer networks which are used primarily for course instruction but are available for graduate and undergraduate student
Computing Services on Campus

research. MAD also supports computer terminals for accessing central services (IBM CMS) and Faculty computers (DEC VMS and ULTRIX).

Specialized equipment and software are available for course instruction and research in Remote Sensing, Computer Assisted Cartography, Geographic Information Systems, and Computer Assisted Architectural Design. Training sessions and consulting are provided by MAD staff.

Access to the services in MAD is arranged by visiting the MAD general office in ES2 - 163B.

MATHEMATICS FACULTY COMPUTING FACILITY

Director
J. Black, BSc (Calgary), Diplôme d’Ingénieur (Grenoble), PhD (Waterloo)

Manager – Hardware
K.L. Martin, BSc (New Brunswick), PEng

Manager – Software
W.C.W. Ince, BMath, MMath (Waterloo)

Manager – Operations
G.P. Embro

The Mathematics Faculty Computing Facility (MFCF) has a dual mandate to supply a research tool for computer science research, and to provide all departments of the Mathematics Faculty with computing services supplementary to those available from the Department of Computing Services. The principal service provided to meet this mandate is general purpose time-sharing.

At the present time, the systems operated by MFCF include a MIPS M/6280, several VAXes (an 8650 and eleven microVAX II’s), a network of seventeen SUN 3/50’s workstations paired with 17 NCD X-window terminals connected to a SUN 3/280 fileserver, one SUN 3/280, one SUN 3/160, one MIPS M/2000, one MIPS M/120, one Sequent S81 and five IRIS colour graphics workstations. All of these run some variant of the Berkeley UNIX operating system. Software includes several text editors, electronic mail, user-controlled archiving, plotting, text formatting, typesetting, and a wide range of general and special-purpose languages.

Communication between machines is primarily implemented with Ethertones. Traffic between machines consists primarily of file transfers, electronic mail, print requests, and remote logins. MFCF participates in the UNIX-based USENET which provides news and computer conferencing between on-campus UNIX systems and a continent-wide collection of participating sites. Electronic mail connections exit (directly or indirectly) to several global mail networks.

Users at terminals may access machines operated by MFCF via a campus-wide Sytek local area network, Gandalf modems, dial-up telephone lines, or Datapac. Hard-copy output can be obtained from a variety of devices, e.g., line printers, laser printers, and a Linotronic 300 phototypesetter. Several of the graduate student offices are equipped with terminals. These terminals are connected to the Sytek network which provides access to any of the on-campus computers. A terminal room which contains ten terminals, an impact printer, and a laser printer, is also provided for the use of faculty and graduate students.

MFCF operates a number of laboratories for use in graduate and undergraduate courses. These include a real-time programming lab, a microsystems lab, a Maple instructional lab, and a Macintosh II lab for first year computer science courses.

SCIENCE FACULTY COMPUTING

Associate Dean for Computing
C.I. Mayfield, BSc, PhD (Liverpool)

Computer Liaison Officer
A. Fleming, BMath (Waterloo)

The Faculty of Science has a broad range of computer facilities available to undergraduates. Courses are taught using the IBM mainframes and each student in those courses is issued an account. In addition, there is a JANET or WATSTAR network in each of the four departments and the School of Optometry and these networks are used by students in many courses. The networks typically have eight to 32 IBM-PC microcomputers linked to a central “file server” unit. Students are allocated disk space on this unit according to the requirements of the courses. For general use by all students in the Faculty, there is a group of networked Commodore Amigas running Unix, AmigaDos and MS-DOS, and a group of Zenith (IBM PC compatible) and Apple computers equipped with word processing, graphics, statistics and general programming software. They are linked to a laser printer, a plotter and a film recorder for high quality output. Students will also encounter computers in many of the laboratories since they are used as data acquisition and analysis systems for scientific apparatus. In the Microcomputer Interface Laboratory in the Department of Physics, students gain “hands-on” experience in both the hardware and software aspects of such interfacing. Plans are underway to provide software support for student-owned microcomputers.

OTHER FACILITIES

In addition to these major centres, a number of other computer systems are located in various laboratories across the campus. Some of these are used in courses and others are dedicated to research.
Faculty of
Applied Health Sciences

The five program areas of the Applied Health Sciences Faculty.
Faculty of Applied Health Sciences

The Faculty of Applied Health Sciences consists of the Departments of Dance, Health Studies, Kinesiology, and Recreation and Leisure Studies, and the Program in Gerontology. The major theme of the Faculty is the development of knowledge and programs related to health and well-being. Inasmuch as contemporary definitions of health and well-being, such as that of the World Health Organization, embrace the mental and social, as well as the physical dimensions of life, the activities of the Faculty address the contribution to be made to the effective understanding of these issues through an interdisciplinary approach.

The emphasis is on the interaction between biological and behavioural factors as they contribute to 1) promoting health, 2) treating disease, 3) minimizing the impact of disease and 4) fostering enhanced quality of life. This is reflected in the variety of academic perspectives provided by the research and teaching activities of the various programs within the Faculty. These include identification of the factors which place individuals at risk for developing disease, using appropriate scientific methodology to address psychological and sociocultural influences, as well as basic biological mechanisms. This knowledge is applied to the strategic development of programs which enhance the health status of populations, as well as to the identification of the principles underlying effective large scale dissemination of such programs.

The study of leisure and cultural phenomena, their related environments and historical development, contributes to the development of leisure and cultural opportunities and practices which are integral to the well-being of groups and individuals. General and specific problems associated with leisure services include their public acceptance, financing, quality, quantity, distribution and modes of delivery. Of increasing interest is the impact of new technologies on leisure and cultural practices.

The Departments of Health Studies, Kinesiology and Recreation and Leisure Studies offer both Regular and Co-operative programs. Dance is offered through the Regular program.

Dance

The Dance program offers students an opportunity to gain the breadth of intellectual and physical skills, as well as the specific expertise, necessary for a range of careers in the world of dance. The three Areas of Concentration, the History-Culture, the Developmental Foundations for Teaching and the Academic-Professional area, comprise a balance between studio and classroom work. Whether students plan careers as teachers, critics, choreographers, company managers, performers or writers, they will be able to draw upon a thorough knowledge of the art. Joint Honours degrees with French, History, Psychology and Recreation and Leisure Studies offer further career options. A Dance degree may also lead to graduate work at other institutions in choreography, criticism, history, notation, education or therapy.

Applied Health Sciences

Programs

Gerontology

The number of older people in the population of many countries, including Canada, is growing steadily. Within twenty years, the number of Canadians 65 years of age and over will comprise about 12% of our total population. The changing age structure of Canada's population raises a number of questions whose answers require a thorough understanding of the aging process and the life circumstances of older people. The area of study that provides this understanding is gerontology.

Gerontology is a wide-ranging field that makes use of knowledge obtained from several disciplines. For example, gerontologists with a background in psychology examine age-related changes in such functions as perception, thinking and learning. Gerontologists with a background in sociology investigate relationships between the aging person and society, while gerontologists with a background in environmental studies direct their studies to the impact of the environment on aging. Gerontologists with a background in biology investigate changes that occur at the cellular, systemic and organismal level over time for the purpose of understanding the aging processes.

The Program in Gerontology seeks to provide an understanding of aging processes and to prepare students for careers in professions that deal directly or indirectly with the care of the elderly. It also offers professional development for those already working in the field, as well as an opportunity for non-specialists to increase their awareness of aging and the situation of the older person. Employment opportunities in gerontology include research and teaching, but most often students take advantage of opportunities in administrative areas, which may be at the federal, provincial or municipal level or in institutions dealing with frail elderly, or being involved with well-elderly populations.

Students interested in gerontology can proceed to the Diploma in Gerontology which is specifically designed for part-time students, particularly those who desire some training in the field but who are not necessarily seeking a degree. It is also intended for persons who already hold a degree and wish to increase their understanding of aging. Apart from the Diploma, the Gerontology Program offers a Minor in Gerontology designed for students who are pursuing any type of Honours degree and who wish to gain some specialization in the field. Requirements for the Minor are the same as for the Diploma, except that a practicum is not required.

Health Studies

Students in the Health Studies program examine important health problems and their causes. Of primary interest are diseases such as lung cancer and heart disease in which behaviour is an important contributing cause. Also of interest are health problems which occur because people do not use preventative health-care services, such as periodic health examinations, vaccinations, and screening procedures, or because they do not comply with prescribed medical treatment.

Opportunities for employment exist in community and
government health agencies, community and school health education, and other areas where an understanding of health and health behaviour is required. Graduates also pursue graduate studies in medicine, public health, health administration, environmental health, health education, and related fields.

**Kinesiology**
The Kinesiology program permits the student to study, in depth, the science of human movement. Many of the course offerings are not found elsewhere. A primary feature of the program is the breadth and depth of preparation in the biological, physical and social sciences. This forms a career foundation for a future which will demand both competence and flexibility.

The program may be customized by selecting specialized electives within the department. Traditional electives (e.g. Anatomy, Physiology, Biomechanics) allow the development of expertise in research-based occupations such as gait analysis in rehabilitation, microgravity or underwater physiology, work-station design and worker efficiency. In keeping with contemporary applied emphases, competence may also be developed in advanced practicum courses in sports medicine, cardiac rehabilitation, and movement assessment. Project-oriented courses are offered in biomechanics, sport psychology, and clinical studies such as the role of cognitive dysfunction in motor skill. Students with this preparation in Kinesiology find careers in areas such as ergonomics, special education, fitness management, and exercise therapy for the elderly. Further specialization in graduate schools or in professional programs (e.g. medicine or chiropractic) is also pursued by our top graduands.

The program may be further tailored to individual interests and careers by selecting elective courses in renowned departments on campus, many of which offer Joint Honours degrees with Kinesiology (see Academic Programs section) or a minor (e.g. Chemistry, Biology, Computer Science). Several Option Programs (e.g. Ergonomics, Gerontology, Management Studies, Society, Technology and Values) may be taken to broaden the science base and elective specialization of the programs in Kinesiology.

**Recreation and Leisure Studies**
Recreation and Leisure Studies combines a knowledge of people, environments and management into an academic package that prepares graduates for careers in a variety of public and private agencies. In addition, the program provides a good foundation for future graduate studies. This Honours Bachelor of Arts program allows students to obtain a proficiency in a specialization by taking one of the following options:

1. Business Option
2. Parks Option
3. Therapeutic Recreation Option
4. Tourism Option

Students also have the freedom to complement their Recreation and Leisure Studies program with courses from a broad range of subjects offered outside of the Department. Business, Dance, Geography, Gerontology, Kinesiology, Planning, Psychology, Public Administration, and Sociology are popular choices.

Through technical and report writing, group and independent projects, interactions with leading professionals from the field, research, applied computer work, presentations, and case studies, students develop professional skills which are marketable in most employment settings.

The diverse backgrounds of the 13 full-time professors, the variety of courses from which students may choose, and the option to select the Co-operative or Regular mode of education, make Recreation and Leisure Studies at the University of Waterloo one of the leading programs of its kind in North America.

**Degrees**
Health Studies graduates receive an Honours Bachelor of Science degree. Kinesiology graduates receive either an Honours Bachelor of Science degree or a General Bachelor of Science degree. Recreation and Leisure Studies program graduates are granted an Honours Bachelor of Arts degree. Those students who graduate from a Dance program receive an Honours Bachelor of Arts degree or a General Bachelor of Arts degree. Studies in Gerontology lead to either a Diploma, or a Minor in Gerontology in conjunction with any type of Honours degree.

Graduates who have pursued their studies in a Co-operative program and who have successfully completed four work terms, four work reports, and who remain registered in the Co-operative program, will have the words “Co-operative Program” added to their University diploma.

**Systems of Study**

**Co-operative System**
In the Co-operative system of study, after the eight-month academic year, the student alternates four-month academic terms on campus with four-month terms of related work experience.

Arrangements for work assignments are made through the Department of Co-operative Education and Career Services of the University which provides the liaison between the campus and the field situation. Students should refer to Chapter 5 of the Calendar for further details concerning the Co-operative program.

**Regular System**
In Regular programs students attend school during the Fall and Winter terms each year for three or four years.
Admission

The admission categories, requirements and procedures for all programs are outlined in detail in Chapter 2 of this Calendar. The following points emphasize some of the admission requirements which relate specifically to programs in the Faculty of Applied Health Sciences.

Application from Ontario Secondary Schools

Applicants to the Health Studies program are required to select a university-entrance level program which includes Ontario Academic Course credits for both Biology and Chemistry. Calculus, Chemistry and one of Biology or Physics are the admission requirements for Kinesiology.

Students applying to the Dance program are required to attend an audition.

Advanced Standing

Normally, students transferring to Applied Health Sciences programs from other universities are granted credit for courses in which they have received a grade of C- (60%) or better. All transfer students will be required to complete at least the equivalent of one half of their program at Waterloo regardless of the number of courses that are presented for transfer. Grades achieved in courses which are transferred are not used in the calculation of averages.

One term of advanced work experience standing may be granted to students transferring into the third year of Co-operative programs in Applied Health Sciences. Details are available from the Department of Co-operative Education and Career Services.

Students transferring to the Faculty of Applied Health Sciences from another University of Waterloo Faculty have two options with respect to the assignment of transfer credits. These options are:

Option One: All courses, both passed and failed, taken in other Faculties at the University of Waterloo are transferred and are used in the calculation of cumulative and major averages.

Option Two: Only courses in which a grade C- (60%) or better has been achieved will be transferred. These courses will not be used in the calculation of cumulative and overall averages.

English Language Proficiency Requirement

The Faculty of Applied Health Sciences feels that a student in any of its programs should be able to demonstrate competency in writing before qualifying for a degree. Therefore, all students entering an Applied Health Sciences program who present an OAC English mark of less than 80% must write an English Language Proficiency Examination (scheduled during registration week). A grade of 50% or better on the examination will satisfy the requirement. If a student fails the examination, the requirement can be satisfied by one of the following:

Applied Health Sciences
Admission
Examinations and Standings

1. Sitting for the examination again and achieving a mark of 50%.
2. Successfully completing the assignments of the UW Writing Clinic.

This requirement normally must be met by the end of Year Two.

Examinations and Standings

1. Final Examinations

   a) In all courses each student is required to submit in such form and at such time as may be determined by the instructor, evidence of satisfactory participation in term work. The marks obtained for work during the term are used, in part, in determining standing. The ratio in which marks for term work and written examinations are combined is at the discretion of the individual departments. To pass a course, a student must obtain a minimum of D- in the combined term and examination marks. Some courses and/or instructors may not require final examinations. In such cases term work only will be used in determining a final grade.

   b) Students absent from examinations, except for properly certified reasons, do not have make up privileges, and must repeat the entire course. If a student has a Doctor's certificate covering the precise period of absence, with legitimate medical grounds, it must be submitted to the Associate Dean for Undergraduate Affairs within one week of the scheduled examination.

   c) All examinations which receive a failing grade are automatically reassessed by the instructor. Students who wish to question their final grade should document their reasons in writing and consult with the Associate Dean. This may lead to either requesting an official reassessment of the grade by a second reader or to an appeal.

   d) Examination results are issued to individual students by the Registrar. Appeals against faculty decisions made under these regulations should be made in accordance with the regulation laid out in the Student Appeal Policy and Procedures (see page 1:10).

Additional regulations concerning examinations may be found in Chapter 1.

2. Standing

   a) The Faculty has endorsed the letter grade system outlined in Chapter 1 of this Calendar.

   b) Overall standing will be determined at the end of each academic year for Regular programs and upon completion of the B term for Co-operative programs by the cumulative average of all courses taken at the University while enrolled in the Faculty (whether passed or failed).
e) Students who have successfully completed fewer than
ten term courses will be considered Year One; those
who have successfully completed at least ten term
courses but fewer than 21 will be considered Year
Two; those who have successfully completed at least
21 term courses but fewer than 31, Year Three; and
those with 31 or more, Year Four.

d) It should be noted that all programs use the term-
course system (see page 1:8 of this calendar for a
description of this system). This means that courses
with credit weight of .75 offered by other departments
will only count as one term course. Similarly, courses
with a credit weight of .25 will be considered as one-
half of a term course.

e) Students who are readmitted after being required to
withdraw may choose to have their average cleared.
See page 8:4 regarding transfer credit options.

The following cumulative averages are required to
proceed in the programs of the Faculty:

<table>
<thead>
<tr>
<th>Cumulative Averages</th>
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<tbody>
<tr>
<td>Program</td>
</tr>
<tr>
<td>Kinesiology Honours</td>
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<tr>
<td>Health Studies Honours</td>
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<tr>
<td>Kinesiology General</td>
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<tr>
<td>Recreation Honours</td>
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<tr>
<td>Dance Honours</td>
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<tr>
<td>Dance General</td>
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Kinesiology, Health Studies and Dance students who
receive a grade report with one of F, INC, DNW or NMR in
any one academic year are placed on probation for the
following academic year. Students enrolled in these
programs who receive a grade report with two or more of
any combination of the following: F, INC, DNW or NMR in
any one academic year are designated as "May not
proceed in the program." Recreation and Leisure Studies
students who receive two grades of F in one year are
required to withdraw. Students in this program who receive
a final grade of INC or NMR in any courses are placed in
Conditional Standing. (The designation F takes into
account all failing grades, i.e. F, F, and F +.)

If a student clears his/her, F, INC, NMR, and DNW
grades prior to the next term or session, this grade change
may result in a change in the decision on his/her grade
report. When an INC is given in a course, all work in that
course must be completed by a date agreeable to
instructor and student up to a maximum of seven months
from the end of the term in which the course was first
taken.

All grades awarded to a student are recorded on the
transcript. If a student fails a course, then repeats the
course and passes it, both courses are shown on the
transcript and both marks are counted in the overall and/or
major average. The same rule holds for a student who
upgrades a course (e.g. from a D to a B) by taking the
same course twice.

Students who are required to withdraw are eligible to
apply for readmission only after one year's absence. It is
recommended that during this absence, students do some
academic work (extension, correspondence, or community
college study). Performance in such course work will be
taken into consideration in assessing applications for
readmission.

3. Honour Roll
To recognize outstanding academic achievement the
Faculty has established the Faculty of Applied Health
Sciences Honour Roll.

To be included on the Honour Roll, the student must
normally be registered full-time and must achieve a
cumulative 80.0% overall average and a cumulative 80.0%
icient major average. A student with an INC, DNR, NMR or F on
his/her record will not be included on the list.

4. Submission of Course Material
In situations where a student wishes to submit a body of
material to satisfy the requirement of more than one
course, the student must notify the instructors of both
courses of his/her intention where the courses are
concurrent so that they may each decide what is
appropirate for their own course.

When one of the courses has been taken in a previous
term, the current course instructor must be informed by the
student of his/her intention of submitting the same course
material. The current instructor has the final decision on the
extent to which the material is allowed.

Failure of a student to comply with the above
regulations constitutes an academic offence.

Program Selection

Full-time students: All students normally take five term
courses in both Fall and Winter terms.

Part-time studies or reduced programs: Except in
exceptional circumstances, an Honours program may not
be taken on a completely part-time or reduced program
basis.

All undergraduate Honours degree programs in the
Faculty of Applied Health Sciences must be successfully
completed within eight calendar years from the time the
student first enters the program. Students may complete a
segment of their program on a part-time basis but,
normally, must successfully complete a minimum of 50%
of their degree requirements while enrolled in full-time
study (i.e. minimum of five courses per term) in the Faculty
of Applied Health Sciences. In the case of students who
have been granted the equivalent of one year of advanced
standing, the Applied Health Sciences program must be
completed in seven years and in the case of students who
have been granted the equivalent of two years of
advanced standing, the Applied Health Sciences program
must be completed in six years. The Faculty of Applied
Health Sciences does not encourage part-time studies,
with the exception of the Diploma in Gerontology.

However, a General degree may be pursued on a part-
time or reduced-program basis subject to approval by the
Associate Dean of Undergraduate Affairs and the department concerned. Normally, no first-year program for a full-time student may be reduced below the ten courses minimum except in very exceptional circumstances.

Auditing a Course
It is the responsibility of the student to inform the course instructor at the beginning of the course that he or she would like to audit the course. The instructor and student may then form a contract outlining the particular auditing requirements for that course.

Letter of Permission Policy
A student may request permission to take a course(s) at another university for credit at Waterloo. A maximum of ten term courses (or equivalent) can be obtained this way, provided the grade is C- or above. The Associate Chair may approve up to five term courses (or equivalent). Requests for approval for additional courses must go to the Applied Health Sciences Undergraduate Affairs Committee. To obtain any approval the student must obtain a Letter of Permission Request form from the Registrar's Office and provide the details of the course(s) to be taken, appropriate course descriptions and the reasons for the request. When approved and the appropriate fee paid, the Registrar's Office will prepare the Letter of Permission and forward it to the student, the host university and the major department concerned.

It will be the student's responsibility to ensure that an official transcript is sent to the Assistant Registrar, Faculty of Applied Health Sciences, Needles Hall, University of Waterloo, Waterloo, Ontario within two months of the completion of the course(s).

Note
The granting of any Letter of Permission request by the University of Waterloo does not necessarily ensure that the student will be able to enrol in the approved course at the other university. There may be restrictions on class enrolments, etc. at that institution. Students should contact that institution's Registrar's Office for procedural details.

Correspondence Courses
For those students who would like to study part time and/or are not able to attend classes on campus, correspondence courses are available to them. In addition, correspondence courses may, under some circumstances, be taken while on a work term. The Associate Chair for Undergraduate Affairs is the only individual who can grant permission to enrol in a correspondence course. Permission must be granted before the student enrolls in the course and/or the course commences.

Course and Program Changes
1. Up to the end of the first two weeks of lectures, the student may drop or add any elective course without approval, provided he or she does not predetermine a section.

2. After the first two weeks of classes any course may be dropped provided the course instructor initials the drop, and either the Associate Chair or the Associate Dean for Undergraduate Affairs signs the registration form. This policy will permit course drops only up to November 1 in the Fall term, March 1 in the Winter term and July 1 in the Spring term. In the event that any of the above dates fall on a holiday or weekend, the final drop day will be the last school day prior to the listed date.

3. Students may withdraw from a program without academic penalty up to November 1 in the Fall term, March 1 in the Winter term and July 1 in the Spring term. In order to withdraw from a program (i.e. the University) a student must complete a standard Student Withdrawal form which is available in the Registrar's Office. This form must be signed by the appropriate Associate Chair, Undergraduate Affairs.

4. Students should note the financial implications of dropping courses or withdrawing from programs (see page 3:3).

Appeals
Appeals are governed by the UW Student Appeal Policy and Procedures, outlined briefly on page 1:10 of this calendar. Appeals cover any academic grievance by a student where it is alleged that a University policy or regulation has been violated, or applied in an unfair or erroneous fashion. Section 8 of that document states that "Students shall seek remedies for their grievances promptly; unless a student's program requires a prolonged absence from campus (e.g. an approved study term abroad; a Co-op work term), a student must lodge a grievance within six months either of being notified of an adverse decision or from the end of the term in which the alleged event or series of events occurred." Upon graduation, a student's right to appeal ceases. Appeal forms may be obtained by making an appointment to speak with the Associate Dean of Undergraduate Affairs.

Petitions
Petitions cover any student request to deviate from established procedures or regulations, while not disputing these procedures and regulations. Petition forms may be obtained from the Associate Chair for Undergraduate Affairs in each department. The Associate Chair will review the petition and make a decision, which will then be forwarded to the Registrar. In the event of an unfavourable decision, the student may pursue the matter further in writing through the Associate Dean of the Faculty at the level of the Undergraduate Affairs Committee, whose decision shall then be final.
Dance

The Dance program at the University of Waterloo enables students to pursue dance as both academic and applied study.

To provide the necessary knowledge for varying career interests, two different degree programs are offered: the Honours Bachelor of Arts and the General Bachelor of Arts. The General degree program comprises three years of study and is designed for students who are interested in acquiring an overall knowledge of the subject of dance. The Honours degree program comprises four years of study with the opportunity to specialize in the History-Culture, Developmental Foundations for Teaching, or Documentation areas of concentration. The fourth area of concentration, the Academic-Professional area, combines an Honours Bachelor of Arts five-year degree program with the Teacher Training Program at The National Ballet School; the student graduates with both an Honours Bachelor of Arts (Dance) and a Diploma from The National Ballet School.

Areas of Concentration (AOC)
The History-Culture area focuses on the art of dance in the Western world, with a view to fostering an understanding of the nature of the art past and present, as well as the factors which influence its development.

The Developmental Foundations for Teaching area examines the preparation of the dancer and artist within the context of the developmental process, particularly during the critical years of childhood and adolescence.

The Documentation area examines the issues involved in documenting dance, for practical purposes (i.e., the maintenance of professional dance repertoire) and for historical purposes (i.e., the preservation of dance heritage). Students explore the complementary use of dance notation, the written word, photography, film, video, and evolving computer technology as a means of "making permanent the impermanent."

The Academic-Professional area merges a broad theoretical study of the art of dance with training specific to the teaching of classical ballet. Those interested must consult a faculty advisor for details concerning eligibility and course sequencing.

Joint Honours Degrees
Joint Honours degrees are available with French, History, Psychology and Recreation and Leisure Studies. Requirements in the Joint Honours Programs vary and students should consult the Associate Chair Undergraduate Affairs in both departments regarding course sequencing, course or credit requirements, minimum averages and required courses.

Minors
A minor program in Dance consists of ten term courses or the equivalent. Students must complete Dance 110, 111, 230, 235, plus six term courses. The equivalent of four term course credits in dance technique may be included.

Course Requirements
To be eligible for the Honours BA degree in Dance, students must successfully complete 44 term courses, and maintain an overall cumulative average of 63% and a cumulative average of 67% in their Dance courses. To be eligible for the General BA degree, students must successfully complete 30 term courses and maintain a minimum overall cumulative average of 60% and a minimum cumulative average of 63% in their Dance courses.

Honours Bachelor of Arts Degree Program
1. Required Dance Courses (17)
   - Dance 110, 111, 230, 235, 336; 351 or 353; 241 & 341 or 242 & 342; 410
   - Four term courses in area of concentration*
   - Four term course equivalents in dance technique
2. Required Outside Courses (ten)
   - Two of ENGL 109, 110, 140R, 141R, 150, 151, 210C
   - MUSIC 100 and 111
   - PSYCH 101
   - Five term courses in area of concentration*
3. Dance Electives (seven)
   - Seven term courses in Dance, including up to four term course equivalents in dance technique
4. Other Electives (ten)
   - Of the ten term course electives, at least five must be taken within the Faculty of Arts.

* Students enrolled in the BA (Hons) must select area of concentration (AOC) courses appropriate to History-Culture, Developmental Foundations for Teaching, or the Academic Professional area, in consultation with a faculty advisor.

Suggested Course Sequence

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<tr>
<th>Year One</th>
<th>Year Two</th>
<th>Year Three</th>
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<tbody>
<tr>
<td>DANCE 110</td>
<td>DANCE 241 or 242</td>
<td>DANCE 336</td>
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<td>DANCE 230</td>
<td>DANCE AOC</td>
<td>DANCE AOC</td>
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<tr>
<td>DANCE technique</td>
<td>DANCE technique</td>
<td>DANCE 351 or 353</td>
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<tr>
<td>Required ENGL</td>
<td>Required ENGL</td>
<td>DANCE AOC</td>
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<tr>
<td>MUSIC 100</td>
<td>MUSIC 111</td>
<td>DANCE AOC</td>
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<tr>
<td>PSYCH 101</td>
<td>Arts Elective</td>
<td>Outside AOC</td>
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<td>Arts Elective</td>
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Joint Honours degrees are available with French, History, Psychology and Recreation and Leisure Studies. Requirements in the Joint Honours Programs vary and students should consult the Associate Chair Undergraduate Affairs in both departments regarding course sequencing, course or credit requirements, minimum averages and required courses.

Minors
A minor program in Dance consists of ten term courses or the equivalent. Students must complete Dance 110, 111, 230, 235, plus six term courses. The equivalent of four term course credits in dance technique may be included.
Year Four
DANCE 410 DANCE Elective
DANCE Elective/Technique DANCE Elective/Technique
DANCE Elective DANCE Elective
DANCE Elective Technique technique
Outside AOC Arts Elective
Elective Elective

Honours Bachelor of Arts: Academic/Professional Area of Concentration*
1. Requirements for Program A** (six)
   DANCE 110, 230, 235, 351, 366 and one other dance course.
2. Requirements for Programs A and B** (30)
   a) Required Dance Courses (eight)
      DANCE 111, 241, 264A, 336, 341, 367, 410, 484
   b) Required Outside Courses (eight)
      Two of ENGL 109, 110, 140R, 141R, 150, 151, 210C, PSYCH 101
      Five term courses in area of concentration*
   c) Dance Electives (two)
      Two term courses in Dance
   d) Electives (12)
      Of the 12 term course electives, at least five must be taken within the Faculty of Arts.

* The Academic/Professional area of concentration is offered in conjunction with the Teacher Training Program of The National Ballet School. Entrance to Program A is by audition only, at the end of Year One. Students wishing to pursue this program must consult the Associate Chair Undergraduate Affairs regarding course selection and sequencing.

**Program A: three years at the University of Waterloo followed by two years at The National Ballet School.
Program B: three years at The National Ballet School followed by two years at the University of Waterloo.

General Bachelor of Arts Degree Program
1. Required Dance Courses (12)
   DANCE 111, 110, 230, 235, 336; 351 or 353; 241 & 341 or 242 & 342
   Four term course equivalents in dance technique
2. Required Outside Courses (five)
   Two of ENGL 109, 110, 140R, 141R, 150, 151, 210C
   MUSIC 100 & 111
   PSYCH 101
3. Dance Electives (three)
   Three term courses in DANCE, including up to two term course equivalents in dance technique.
4. Outside Electives (ten)
   Of the ten term course electives, at least five must be taken within the Faculty of Arts.

Applied Health Sciences
Dance
Gerontology

Suggested Course Sequence

Year One
DANCE 110 DANCE 111
DANCE 230 DANCE 235
DANCE Technique DANCE Technique
Required ENGL Required ENGL
MUSIC 100 MUSIC 111

Year Two
DANCE 241 or 242 DANCE 341 or 342
DANCE Technique DANCE Technique
PSYCH 101 Arts Elective
Arts Elective Arts Elective
Elective Elective

Year Three
DANCE 336 DANCE 351 or 353
DANCE Elective Technique DANCE Elective Technique
DANCE Elective Elective
Elective Elective
Arts Elective Arts Elective

Gerontology

The Area of Gerontology
In recent years there has been an increased interest in the older person and in the aging process. An important reason for this interest is the recent growth in the proportion of older people in the population of many countries, including Canada. A host of concerns has been raised by the changing age structure of the Canadian population, which can be addressed properly only by examining carefully the aging process and the circumstances of the older person—the field of study known as Gerontology.

Gerontology involves a number of disciplines. Biologists investigate, for example, the changes at the molecular, cellular and organismal level that take place over time, with a view to possible modification. Gerontologists trained in fields such as Psychology, Sociology, Health Studies and Environmental Studies focus on other age-related changes in individual and population aging. To illustrate, psychologists examine the changes with age in psychological functions (perception, thinking, learning) whereas sociologists are interested in reciprocal relationships between the aging person and society. Similarly, those with a background in Environmental Studies direct their attention to the impact of the environment on aging.

The University of Waterloo Program in Gerontology
The introduction of a multidisciplinary Gerontology program is intended to provide a focus to aging studies at Waterloo. The program of courses offered has two components: a Minor in Gerontology and a Diploma in Gerontology. The latter component may be of particular interest to part-time, mature students. In addition, some
graduate studies and research are carried out within the program.

The Minor and the Diploma represent multidisciplinary programs, combining courses from a variety of departments such as Biology, Optometry, Psychology, Sociology and Statistics. These programs are intended to enhance students' understanding of aging processes and to prepare students for careers in those professions which deal with the care of the elderly in other relevant professions. The programs provide professional development to those already working in these areas, and raise the awareness of the non-specialist for this important, emerging area of study and concern.

The Minor program is open to students pursuing an Honours degree at the University of Waterloo in any discipline who wish to obtain some specialization in Gerontology.

The Diploma program is available to those who would like some training in Gerontology but are not interested in completing all the requirements of an undergraduate degree. It is also available to those who have already completed an undergraduate degree but would like to obtain a better understanding of the aging phenomena.

The program of study for the Minor and for the Diploma consists of a selection of five required and five optional courses.

**Academic Requirements for the Minor**

1. Students must be in an Honours Program at the University of Waterloo.

2. Successful completion of five core courses, including the Multidisciplinary Seminar and, in addition, successful completion of five courses selected with the approval of the program committee from the list of optional or core courses. Students will have to take at least one of Gerontology 255 as part of the core requirements.

3. An overall minimum average of 65% in the ten academic courses.

**Core Courses (five to be completed)**

- GERON 255/ SCI 255: The Biology of Aging
- GERON 400: Multidisciplinary Seminar on Aging
- GERON 402/: MTHEL 402B: Epidemiology of Aging
- GERON 344/: KIN 352/: SOC 344: Sociology of Aging
- PSYCH 217: Aging and Basic Psychological Processes
- PSYCH 218: Aging, Dying and Death
- GERON 247/: SOC 247: Death and Social Structure

**Optional Courses**

- GERON 208/: ENGL 208F: The Literature of Aging
- GERON 401A/B: Directed Studies in Special Topics

**Applied Health Sciences**

Gerontology
Health Studies

- GERON 403/: MTHEL 402A: Topics in Mathematical Aspects of the Medical Sciences 1
- ANTH 404: Human Development in a Cross-Cultural Perspective: Human Development, Aging and Death
- BIOL 433: Stress Physiology and Aging in Plants
- CS 316: Introduction to Statistical Problem Solving by Computer
- ECON 353: Population Economics
- HLTH 245: Community Health
- HLTH 210: Growth, Development and Aging
- HLTH 472: Special Topics: Aging, Immunity and Health
- ISS 350D: Adult Life Crises and Events
- OPTOM 449: Community Health Optometry
- OPTOM 452: Special Populations
- PHIL 226: Ethics and Life Sciences
- PHYS 480: Radiation Biophysics
- PLAN 414/416: Issues in Housing
- PLAN 420: Health, Environment and Planning
- REC 361: Aging and Leisure
- RS 271: Personality and Religion
- RS 400A: Aging as Spiritual Journey
- SOC 248: Health, Illness and Society
- SOC 343: Sociology of Health Care
- SOC 415: Social Networks
- SOC WK 240R: Palliative Care
- SOC WK 367R: Social Work with the Elderly

An approved course in Statistics

**Further Information**

Enquiries are encouraged and additional information can be obtained by writing or calling:

The Director (W.F. Forbes)
The University of Waterloo Program in Gerontology
PAS Building, Room 3010
Ext. 3468

or any members of the Committee (listed in Chapter 17).

**Department of Health Studies**

In Health Studies the knowledge from several traditional disciplines is combined and focused on the study of health and disease. Courses provide students with an understanding of (a) what diseases are, (b) their causes, (c) behavioural factors that contribute to disease, and (d) ways in which health behaviour can be changed.

The curriculum has four core areas:

1. Health Sciences – the scientific facts and principles pertinent to personal and community health. Specific subject areas include: (a) introduction to health sciences, (b) determinants of disease (epidemiology), (c) environmental health, (d) nutrition, and others.
2. Behavioural Sciences – introduction to psychology and sociology, determinants of health behaviour, and health behaviour modification.

3. Biological Sciences – the basic principles of biology, physiology and biochemistry.

4. Evaluation and Research – the principles of statistics and research design aimed at developing sufficient competencies to enable students to evaluate and interpret the findings of health-related research.

Students may apply for admission directly into the Honours Health Studies program, Co-op or Regular.

In order to receive the Honours BSc degree the student must successfully complete 40 term courses including the following requirements:

**Degree Requirements**

1. Required Health Studies Courses: (15)

2. Required Kinesiology Courses: (three)
   - KIN 222, 317*, 330

3. Required Courses from other departments: (seven)
   - BIOL 230, 239, 273
   - CHEM 116
   - CS 316
   - PSYCH 101; SOC 101

4. Restricted electives: (four)
   - One of: ENGL 109 or 210C (recommended for Year One or Two)
   - One of: PHIL 226, 258 (recommended for Year Four)
   - Two of: BIOL 211, 240, 241, 437, 441, 454, 455
   - HLTH 350, 407, 443

5. Free electives:
   - 11 term courses selected in consultation with the student's advisor.

* KIN 317 laboratory is mandatory
** HLTH 443 is a restricted elective only for those students choosing the HLTH 431/432 sequence.

**Course Sequence**

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<tr>
<th>Year One (Co-op and Regular)</th>
<th>Winter</th>
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<td>Fall</td>
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<tr>
<td>HLTH 101</td>
<td>HLTH 102</td>
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<td>BIOL 230</td>
<td>BIOL 239</td>
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<td>PSYCH 101</td>
<td>BIOL 273</td>
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<tr>
<td>SOC 101</td>
<td>CHEM 116</td>
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<td>One Elective</td>
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<th>Year One (Co-op and Regular)</th>
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<td>Health Studies</td>
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<th>Regular Program</th>
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<td>Year Two</td>
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<td>HLTH 220</td>
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<td>HLTH 245</td>
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<tr>
<td>KIN 222</td>
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<td>KIN 317*</td>
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<th>Year Three</th>
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<td>HLTH 341</td>
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<td>HLTH 349</td>
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<tr>
<td>Three Electives</td>
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<td>CS 316</td>
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<tr>
<th>Year Four</th>
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<tr>
<td>HLTH 431 or 433</td>
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<td>HLTH 442</td>
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<td>Three Electives</td>
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<th>Co-operative Program</th>
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<td>Year Two</td>
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<td>HLTH 245</td>
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<td>KIN 222</td>
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<tr>
<td>KIN 317*</td>
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<th>Year Three</th>
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<td>3A (Winter)</td>
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<td>HLTH 210</td>
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<td>HLTH 340</td>
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<td>HLTH 344</td>
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<td>CS 316</td>
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<th>Year Four</th>
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<td>4A (Spring)</td>
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<tr>
<td>HLTH 431 or elective</td>
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<tr>
<td>Four Electives</td>
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<td>Three Electives</td>
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<tr>
<th>Honours Health Studies Program</th>
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<tr>
<td>Pre-Health-Professions Option</td>
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This program combines the Health Studies Honours BSc degree requirements with a specified grouping of elective courses from Chemistry, Mathematics, Physics, Biology, Kinesiology, Sociology and Computer Science. This Option is intended to provide suitable preparation for entry into medical school and other health professional schools, as well as for graduate study in health-related disciplines. However, students are strongly urged to consult the admission requirements of specific professional schools and graduate programs when choosing from the electives.

In order to graduate with this option, the following requirements must be met:

1. An overall cumulative average of 75% and a cumulative average of 75% in Health Studies courses;
2. Successful completion of 21.0 credits, including all the requirements of the Honours BSc Health Studies degree;

3. Successful completion of eight of the following courses (4.0 lecture credits):
   CHEM 120/L, 123/L, 266/L, 267/L
   MATH 113A/B
   PHYS 111/L, 112/L
   BIOL 240, 241, 402, 404, 436, 437, 441, 442, 444
   KIN 102, 200, 201, 242, 300, 321, 340, 341
   SOC 248, 343
   REC 250
   CS 102

Typical Course Sequence*

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<tr>
<th>Year One (Fall)</th>
<th>Year One (Winter)</th>
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<td>HLTH 101</td>
<td>HLTH 102</td>
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<td>BIOL 230</td>
<td>BIOL 273</td>
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<td>CHEM 120/L</td>
<td>CHEM 123/L</td>
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<tr>
<td>SOC 101</td>
<td>PSYCH 101</td>
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<td>One Elective</td>
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<td>HLTH 245</td>
<td>HLTH 346</td>
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<td>KIN 317</td>
<td>KIN 330</td>
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<tr>
<td>KIN 222</td>
<td>BIOL 239</td>
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<td>PHYS 111/L</td>
<td>PHYS 112/L</td>
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<th>Year Three (Fall)</th>
<th>Year Three (Winter)</th>
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<tr>
<td>HLTH 341</td>
<td>HLTH 340</td>
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<td>HLTH 349</td>
<td>HLTH 344</td>
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<tr>
<td>CHEM 266/L</td>
<td>HLTH 348</td>
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<tr>
<td>Two Electives</td>
<td>CHEM 267/L</td>
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<td>CS 316</td>
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<td>HLTH 431 or 433</td>
<td>HLTH 432 or 443</td>
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<td>HLTH 442</td>
<td>HLTH 445</td>
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<tr>
<td>Three Electives</td>
<td>Three Electives</td>
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* Based on typical entrance requirements for many Canadian Medical Schools. For more information contact the Health Studies Department.

A Pre-Health-Professions Option is also offered by the Department of Biology, and suitable preparatory courses may also be taken with a Kinesiology degree program.

Health Studies/Kinesiology
Kinesiology/Health Studies

Joint Honours Degree Program

There are significant numbers of students within Applied Health Sciences whose interests potentially encompass both the Kinesiology and Health Studies programs. The following Joint Honours program is offered through both the Regular and the Co-operative format of study to accommodate those students and to best prepare them for jobs that require backgrounds in both Kinesiology and Health Studies.

Degree Requirements for Joint Honours include:
1. 42 term courses including –
   Health Studies required courses (ten):
   HLTH 101, 102, 245, 341, 348, 349, 431/432 or 433/434, 442, 445
   Kinesiology required courses (13):
   KIN 102, 103, 200, 222, 252, 255, 300, 317*, 321, 330, 335, 354, 470
   Outside Required (ten):
   BIOL 230, 273, CHEM 116
   CO 102, 316, MATH 106, PHYS 103, PHYS 105, PSYCH 101, SOC 101
   Electives (nine):
   a) Kinesiology – four term courses chosen from those electives available in Kinesiology.
   b) Health Studies – three of HLTH 210, 340, 344, 346, 443, one of PHIL 226, 258.
   c) Free – one term course chosen from any department within the University.

* KIN 317 laboratory is mandatory.

2. An overall average and major average of 70% is required in the Joint Honours program.

Department of Kinesiology

Listed below are the course combinations leading to the Honours and General degrees in Kinesiology. Students are encouraged to make full use of the advisory system of the Department in planning their programs.

DEGREE REQUIREMENTS

Honours Program

Successful completion of 40 term courses is necessary in order to obtain the Honours BSc degree in Kinesiology. The program must be completed in eight years.

1. Required Kinesiology courses:
   KIN 102, 103, 152, 200, 222, 255, 300, 317*, 321, 330, 335, 354, 431 or 433, 470.

2. Required courses from other departments:
   *SCI Division

Course Substitution

In the case of CHEM 116, MATH 106 and PHYS 103, students may elect to take a full-year course in the appropriate department.

3. Kinesiology Electives: ten courses from those offered in the Department in addition to the required courses. As part of their Kinesiology elective package, those students who wish to do so may specialize in one of the streams designated by the Department.

4. Electives: Of the remaining seven term courses, five must be chosen from outside the Department of Kinesiology.
Students should choose electives in consultation with their Faculty advisor.

General Program
The General degree is offered on a regular basis only and may be taken by part-time study.
In order to receive the General BSc degree a student must successfully complete 40 term courses including the following requirements:

1. **Required Kinesiology Courses:**
   - KIN 102, 103, 152, 200, 222, 255, 300, 317, 321, 335, 354.

2. **Required Courses from other departments:**
   - *SCI Division

3. **Kinesiology Electives:**
   - Ten elective courses in Kinesiology.

4. **Electives:** Of the remaining ten term courses five must be chosen from outside the Department of Kinesiology.

### Course Sequence

#### Honours and General Program

**Year One**
(Common to Regular and Co-operative programs)

**Fall**
- KIN 102
- KIN 103
- BIOL 230
- MATH 106 or 113A
- PSYCH 101

**Winter**
- KIN 255
- BIOL 273
- CHEM 116
- One Elective

Students may choose a computer science course in place of an Elective in Year One. CS 102 must be completed by the end of 3A or 3N.

#### Regular Program

**Year Two**

**Fall**
- KIN 200
- KIN 222
- SOC 101
- PHYS 105
- Elective

**Winter**
- KIN 152
- KIN 321
- KIN 335
- KIN 354
- One Elective

#### Year Three

**Fall**
- KIN 300
- KIN 317

**Winter**
- KIN 330†
- Four Electives

### Year Four

**Fall**
- KIN 431† or 433†
- Elective

**Winter**
- KIN 470†
- Four Electives

#### Joint Honours Degree

Joint Honours degrees with Psychology and Economics are available in addition to that with Health Studies (page 8:11). Students should consult with the Undergraduate Officer in both departments regarding specific course sequences, course or credit requirements, and minimum averages.

### Health-Professions Preparation Stream**

This stream, available on either a Regular or Co-op basis, combines the Honours Kinesiology Program and its emphasis on human applications, with specific requirements in Biology, Calculus, Chemistry, Physics, Psychology, and Sociology. It is intended to develop an academic profile which may prepare students for potential study in medicine, podiatry, chiropractic, and speech pathology. It is also intended for the student whose interests develop into graduate study in the health disciplines. Students are strongly urged to consult the admission requirements of the professional schools of interest to aid in their choice of electives. Overall and major cumulative averages of 75% are considered minimal for application to programs in the health-professions. A suggested course sequence is available on request from the Department of Kinesiology.

1. **Required Kinesiology Courses:** (14)
   - KIN 102, 103, 152, 200, 222, 255, 300, 317, 321, 330, 335, 354, 431 or 433, 470

2. **Required courses from other departments:** (13.5)
   - BIOL 230, 273, CHEM 120*/120L*, 123*/123L*, 266*/266L*, 120/120L*, 113A*, MATH 113A*, PHYS 111*/111L*, 112*/1121L*, 113A*, PSYCH 101, SOC 101

3. **Kinesiology electives (ten)**
   - Ten Kinesiology courses including at least five of the following: KIN 201, 242, 243, 341, 356, 357, 401, 402, 405, 407, 416, 420, 425, 426, 432, 435, 472, 491, 492
4. Electives (three)
   Three courses must be chosen from the following:
   BIOL 240, 239, 402, 404, 436, 437, 441, 442
   CHEM 267, 267L
   HLTH 341, 442
   HIST 209
   MATH 113B
   OPT 105
   PHYS 480
   PSYCH 261, 307, 357
   SOC 248, 343

* denotes a course in addition to, or substituted for, BSc (Honours Kinesiology) requirements

** Pre-Health-Professions Option Programs are also available in the Departments of Biology and Health Studies

Honours Co-op Kinesiology Program
Ergonomics Option

This limited enrolment Co-op program is intended to help prepare graduates who will contribute to solving workplace problems, particularly in safety ergonomics to reduce the risk of injury and enhance human performance. The course requirements have been selected to provide students with a thorough background in the biophysical and behavioural sciences of human motion and related measurement and problem solving skills. Admission and graduation requirements are listed below.

1. Normally, Co-op Kinesiology students will be admitted to the program for the Fall term in Year Two. First year grades and an interview will be part of the admission consideration. Approximately ten students per year will be selected, dependent upon the number of Co-op jobs available.

2. Normally at least three of the last four work terms, including work term reports, must be ergonomics related.*

3. Forty-four term courses must be completed. (See current list of PROGRAM COURSES)

4. The cumulative averages required are the same as for Honours Kinesiology.

* It is possible that students who are not officially admitted to the program manage to fulfill all of the requirements, including the section of the KIN 470 seminar normally reserved for Ergonomics Option students. These students may petition the Associate Chair to obtain the Degree designation prior to graduation.

Program Courses (44)

1. Required Life Sciences (nine)
   KIN 102, 200, 300, 317, 321, 401, 425, BIOL 230, 273

2. Required Behavioural Sciences (eight)
   KIN 103, 152, 255, 348, 354, 356, PSYCH 101, SOC 101

3. Required Physical & Technical Sciences (nine)
   KIN 222, 330, 335, MATH 113A, PHYS 111/111L, PHYS 112/112L, CHEM 118, CS 102 (SCI)

   4. Required Ergonomics (13):
      KIN 000**, 340, 420, 431*, 432*, 470, 472*, SY DE 142, 442, 543, 548, M SCI 211, 261, HLTH 350

5. Restricted Electives (five):
   Two courses from: KIN 341, 346, 349, 352, 357, 402, 405, 407, 416, 422, 426
   Three courses from departments other than Kinesiology

   Suggested list (but others are allowed):
   HLTH 340, 442, SY DE 281, 342, 444, ME 212, CIV E 203, 460

* KIN 431, 432, 470, 472 must be on Ergonomics topics approved in advance by an Ergonomics Option Advisor.

Typical Course Sequence

<table>
<thead>
<tr>
<th>1A Fall</th>
<th>1B Winter</th>
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<tbody>
<tr>
<td>KIN 102</td>
<td>KIN 255</td>
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<tr>
<td>KIN 103</td>
<td>BIOL 273</td>
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<tr>
<td>BIOL 230</td>
<td>PSYCH 101</td>
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<tr>
<td>MATH 113A</td>
<td>PHYS 112/112L</td>
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<tr>
<td>PHYS 111/111L</td>
<td>CHEM 116</td>
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<thead>
<tr>
<th>2A Fall</th>
<th>2B Spring</th>
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<tbody>
<tr>
<td>KIN 200</td>
<td>KIN 300</td>
</tr>
<tr>
<td>KIN 222</td>
<td>KIN 321</td>
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<tr>
<td>CS 102 (SCI)</td>
<td>KIN 335</td>
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<tr>
<td>M SCI 211</td>
<td>KIN 354</td>
</tr>
<tr>
<td>SOC 101</td>
<td>SY DE 142</td>
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<tr>
<td>Elective</td>
<td>KIN 330</td>
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<table>
<thead>
<tr>
<th>3A Winter</th>
<th>3B Fall</th>
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<tbody>
<tr>
<td>KIN 152</td>
<td>KIN 317</td>
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<td>KIN 425</td>
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<td>KIN 420</td>
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<td>KIN 401</td>
<td>HLTH 350</td>
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<td>SY DE 442</td>
<td>SY DE 543</td>
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<td>Elective</td>
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<table>
<thead>
<tr>
<th>4A Spring</th>
<th>4B Winter</th>
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<tr>
<td>KIN 431</td>
<td>KIN 432 Ergo</td>
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<td>KIN 470 Ergo</td>
<td>SY DE 548</td>
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<td>KIN 472 Ergo</td>
<td>Elective</td>
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<td>M SCI 261</td>
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<td>KIN 348</td>
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<td>Elective</td>
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The Recreation and Leisure Studies program contains a core of courses in leisure studies, research and management. Recreation and Leisure Studies electives provide students with the opportunity to specialize in an Option which reflects a desired academic and career path.

**Degree Requirements**

1. Recreation courses (minimum of 20):
   a) Required (12)
      REC 100, 201 or 205, 209, 210, 220, 230, 250, 270, 280, 371, 470/471 or two 400 level courses.
   b) Recreation Electives (minimum of eight):
      Each student must complete additional Recreation electives to meet the required minimum of 20 Recreation courses.

2. Courses outside the Department of Recreation and Leisure Studies:
   a) Required: (seven)
      PSYCH 101
      SOC 101
      CS 100. Students with computer knowledge may take CS 102 with approval of the Undergraduate Associate Chair.
      Select one course from four of the following seven categories (Restricted Electives):
      i) BUS 121 or ECON 101
      ii) A Fine or Performing Arts or Language course other than English
      iii) GEOG 101 or ENV S 195
      iv) A Science Faculty course
      v) A Health Studies or Kinesiology course
      vi) A Political Science or History or Philosophy course
      vii) An English course
   b) Non-Recreation Electives: (maximum of 13)

3. Total number of courses to complete degree is 40.

**Course Sequence**

### Year One (Co-op) and Regular

#### Fall
- REC 100, 210
- SOC 101
- CS 100
- One Restrictive Elective

#### Winter
- REC 230, 250
- PSYCH 101
- Two Restricted Electives

### Regular Program

#### Year Two

#### Fall
- REC 209, 270, 280
- One Restrictive Elective
- One Non-Recreation Elective

#### Winter
- REC 201*, 220
- One or Two Recreation Electives
- One or two Non-Recreation Electives

### Co-operative Program

#### Year Two

#### 2A (Fall)
- REC 220, 270, 280
- One Restricted Elective
- One Recreation Elective

#### 2B (Spring)
- REC 201 or 205*, 209
- One or two Recreation Electives
- Two Non-Recreation Electives

#### Year Three

#### 3A (Winter)
- REC 201*, 371
- One or two Recreation Electives
- Two Non-Recreation Electives

#### 3B (Fall)
- REC 205*
- Two Recreation Electives
- Two or three Non-Recreation Electives

#### Year Four

#### 4A (Spring)
- REC 470 or other 4th year course
- Two Recreation Electives
- Two Non-Recreation Electives

#### 4B (Winter)
- REC 471 or other 4th year course
- Two Recreation Electives
- Two Non-Recreation Electives

* Students must take one of REC 201 or 205.

### Options

An Option is a specified combination or grouping of courses which provides the student with an emphasis in a particular discipline.

The Recreation and Leisure Studies Department offers the following Options to its students:

1. Business Option
2. Parks Option
3. Therapeutic Recreation Option
4. Tourism Option

Consult the Undergraduate Office for more details. Interdisciplinary Programs are also listed in Chapter 15.
Joint Honours Degrees

Joint Honours degrees are available with Geography, Environment and Resource Studies, Political Science, Psychology, Social Development Studies, Sociology and Music. For Joint Honours programs, where the Department of Recreation and Leisure Studies is the home department, the requirements will be:

1. Department of Recreation and Leisure Studies core requirements (12 term courses)
2. All non-department Restricted Electives (six term courses)
3. Joint Honours requirements from the second department
4. Additional Department of Recreation and Leisure Studies Electives (minimum six term courses)
5. A minimum of 40 term courses in total
6. Major average requirements for each department must be maintained. (The overall average is that of the home department.)

Further information concerning Joint Honours programs may be obtained from the Undergraduate Officer and the student undergraduate handbook.

Minors

A Minor is a group of approved courses taken by an Honours student in a subject area outside of Recreation and Leisure Studies. Minors are available in most departments at Waterloo. Students interested in pursuing a Minor should consult with the department offering the Minor. A Minor normally consists of ten courses.
Drama students participate in a mask and movement exercise as part of DRAMA 490D.
The Faculty of Arts

The main objective of the Faculty of Arts is to provide a liberal arts education which is designed to acquaint the student with some of the major ideas and forces that shape our civilization and other civilizations, to develop the ability to think clearly, critically and creatively, and to make a contribution to living a full life.

Degrees

The degree of Bachelor of Arts (BA) is awarded by the University upon successful completion of any of the undergraduate programs described under Arts Programs.

ADMISSION

1. General Requirements

The admission requirements of the Faculty of Arts are the same as the General Admission Requirements of the University for applicants from Ontario Secondary Schools and for those not currently registered in Ontario Secondary Schools. Admission requirements for part-time students are the same as for full-time students. See Chapter 2 for the admission categories, requirements and procedures for all programs.

Applicants who wish to study full-time must submit their applications through the Ontario Universities' Application Centre (OUAC).

Applicants who wish to study on a part-time or non-degree basis or through correspondence courses may obtain application forms from the Part-Time Studies and Continuing Education Office at the University of Waterloo.

2. Transfer Credit

Upon admission to Arts, transfer credit may be given for university courses related to a Waterloo Arts degree in which a grade of 60% or better was obtained. Students entering Waterloo from other universities may have their transferred courses count toward the University of Waterloo degree; however, marks obtained in these courses will not be included in the calculation of the students' University of Waterloo averages.

Students admitted to Arts from faculties within the University may elect to transfer all passed Arts Faculty courses and all pertinent courses taken from other faculties in which they earned marks of at least 60% (C-). These courses will not be counted in the students' cumulative averages. Alternatively, students may elect to transfer all pertinent attempted courses (passed and failed). Under this option, these courses will be counted in the students' cumulative averages.

Arts Programs

All Arts programs should be drawn up in consultation with the departmental undergraduate advisor.

GENERAL PROGRAMS

1. With a Major

The University offers a General Bachelor of Arts (BA) degree upon successful completion of either a three-year General or four-year General program. A three-year General BA is offered in the following disciplines:

- Anthropology
- Classical Studies
- Drama and Theatre Arts
- Economics
- English
- Fine Arts
- French
- Geography
- German
- Greek
- History
- Latin
- Medieval Studies
- Music
- Philosophy
- Political Science
- Psychology
- Religious Studies
- Russian
- Social Development
- Studies
- Sociology
- Spanish
- Speech Communication

Minors are not allowed in three-year General programs.

Four-year General BA programs are also available in the following disciplines:

- Anthropology
- Classical Studies
- Drama
- Economics
- English
- Fine Arts
- French
- Geography
- History
- Medieval Studies
- Music
- Philosophy
- Political Science
- Psychology
- Religious Studies
- Russian
- Social Development
- Studies
- Sociology
- Spanish
- Speech Communication

There are no double majors in General programs. Minors may be taken with four-year General programs.

2. Non-Major

Students with interests in a variety of disciplines may choose an individualized program rather than major in a single discipline. Any standard first-year Arts program will satisfy the needs of a student contemplating a General Arts (Non-major) program. The program of Non-major General Arts students must be arranged through the Arts Faculty Undergraduate Office.
HONOURS PROGRAMS

1. Regular Programs
An Honours Bachelor of Arts (BA) degree is offered by the University in the following disciplines:

Anthropology
Classical Studies
Drama and Theatre Arts
Economics
English
Fine Arts
French
Geography
German
History
Latin

Medieval Studies
Music
Philosophy
Political Science
Psychology
Religious Studies
Russian
Slavic Studies
Social Development
Studies
Sociology
Spanish

Almost any two Honours programs may be combined or one Arts Honours program may be combined with a number of Honours programs offered in other faculties for a Joint Honours degree. Joint Honours programs other than those already listed under each department may be arranged by consultation with the appropriate department advisors. The undergraduate advisors of both departments should be consulted for any Joint Honours program. Descriptions of the single Honours programs and each discipline's requirements for Joint Honours programs can be found in the section entitled "Departmental Programs" beginning on page 9:9.

2. Co-operative Programs
A Co-operative program is an Honours program that allows the student to integrate work experience with an academic program. (For a detailed description of the Co-operative Plan, see Chapter 5.) Beginning in the first or second year the Co-op student ordinarily alternates four-month terms on campus for academic studies with four months off campus for practical training in business, industry, or government.

Students in Co-operative programs are required to complete a minimum of four work terms beyond the 2A level in order to be eligible to receive a Co-op designation at the time of graduation.

The following Co-operative programs are now offered:

Applied Studies Co-op (See Note below)
Co-op Honours Anthropology
Co-op Honours Applied Economics
Co-op Honours Chartered Accountancy Studies
Co-op Honours English — Literature
Co-op Honours English — Rhetoric and Professional Writing
Co-op Honours Management Accountancy Studies
Co-op Honours Political Science
Co-op Honours Political Science (Administrative Studies)
Co-op Honours Psychology
Co-op Honours Sociology

Co-operative programs are open only to full-time students who are either Canadian citizens or permanent residents.

Note
The Applied Studies Co-operative Program combines an Honours program in most disciplines in Arts with Applied Studies courses. The Applied Studies courses are intended to provide the student with a basic and practical general education and with skills appropriate to a wide range of careers. With the approval of the department, Honours programs in Arts may be combined with the Applied Studies courses for this Co-operative program. See the section entitled "Departmental programs" for details.

MINOR PROGRAMS
Students enrolled in Honours programs or four-year General Major programs in Arts or Honours programs in other faculties may elect a Minor in an Arts discipline. A Minor program in Arts requires the successful completion of ten term courses in the Minor discipline with an overall cumulative average of 65% in those courses. Students should consult with departmental Undergraduate Advisors for details of more specific requirements.

A Minor is available in Italian, although there is no Major program in that discipline.

INTERDISCIPLINARY OPTIONS
Students in a General Non-major program and in many Honours programs within Arts may choose an Interdisciplinary Option or Minor which will be designated on the diploma and transcript. Students in some General programs may choose one of several available Options.

Interdisciplinary Programs Administered by the Faculty of Arts
Gerontology (see Chapter 8)
Speech Communication (see Chapter 9)
Management Studies (see Chapter 15)
Personnel Studies (see Chapter 15)

Other Interdisciplinary Programs (see Chapter 15)
Canadian Studies
International Studies
Latin American Studies
Legal Studies
Middle East Studies
Peace and Conflict Studies
Society, Technology and Values
Soviet and East European Studies
Studies in the French Language
Studies in Personality and Religion
Studies in Sexuality, Marriage and the Family
Women's Studies

Notes
1. Normally a student may not double-count any course for more than one Option or Minor.
2. Students who intend to have an Interdisciplinary Option recognized on their transcripts must communicate that intention to the director of that program by the start of Year Three.
SELECTION OF YEAR ONE PROGRAMS

The first year in Arts is usually an exploratory year during which students take courses in a wide range of subjects leading to the declaration of a General or Honours program and choice of a major. Year One students in Arts are usually classified in a General Arts program. Students admitted to Social Development Studies (Regular) declare General or Honours following a highly specified Year One program. Students admitted to Arts Co-op Applied Studies programs take a number of courses specified by their Honours major.

The Faculty of Arts recommends that its students take at least one course in mathematics and/or science.

Notes
1. From time to time, due to space limitations, students admitted to the University or continuing students in good standing, cannot be granted course and program selections of their choice.
2. Each student’s program must be approved on or before registration date by a faculty advisor from the Faculty of Arts.
3. Students interested in Social Development Studies should consult the Undergraduate Officer at Renison College before selecting a Year One program.

COURSES AND PROGRAM CHANGES

1. Changes in courses or programs must be submitted for approval to the appropriate Undergraduate Officer.

2. Courses may be added during the first two weeks of the term in which they begin only with the signature of the Undergraduate Officer of the student’s major department. Courses may be dropped during the first three weeks of the term in which they begin only with the signature of the Undergraduate Officer of the student’s major department.

3. After these specified periods, courses may be added or dropped only with the permission of the Examinations and Standings Committee acting on the recommendation of the instructor of the course and the Undergraduate Officer of the student’s major department, and only if the student can support his/her case with reasons showing that such a change in program will serve his/her academic interests.

4. Courses offered during the Summer Session may be added or dropped only with the signature of the Undergraduate Officer of the student’s major department, and thereafter only with the permission of the Examinations and Standings Committee.

5. A course that has not been dropped officially (i.e., recorded in the Registrar’s Office) will receive a grade and be counted in the student’s average.

Teacher Certification in Ontario

The Ontario Teacher’s Certificate may be granted by the Ministry of Education after the successful completion of a program taken at an approved Ontario Faculty of Education. The Faculties of Education require that applicants hold an acceptable University degree (BA or BSc or equivalent, three- or four-year General or Honours).

The Honours Specialist Qualification (HSQ) requires:

- An Honours Bachelor’s degree or equivalent; and
- a B average in the subject or subjects in which the HSQ is sought; including
- 18 term courses in the subject for one area of specialization,
- or
- 28 term courses in two subjects (no fewer than 12 in each) for two areas of specialization.

In addition, the applicant for the HSQ must have completed a Faculty of Education program and two years of teaching in an Ontario high school.

Degree Requirements

In order to earn a BA, a student must complete, with the necessary cumulative averages, the required number of prescribed and elective courses for either the General or the Honours program.

It is the student’s responsibility to ascertain that all requirements for graduation have been met. Any exceptions in graduation requirements requested by a student must be approved in writing by the Examinations and Standings Committee of the Arts Faculty.

General Major Program

Students in the three-year General program with a major must complete a minimum of 30 term courses with a passing mark in each. Students in a four-year General program must complete a minimum of 40 term courses with a passing mark in each. All students in General programs with a major must achieve an overall cumulative average of at least 60% and a cumulative average in their major of 65% or better (some programs require a higher major average) and successfully complete:

1. a minimum of 16 term courses or their equivalent beyond the 100-level

and

2. the Faculty of Arts Group A and B requirements (see below).
General Non-major Program
Students in the three-year General Non-major program may graduate upon completion of a minimum of 30 term courses with a passing mark in each, including:
1. a minimum of 16 term courses beyond the 100-level,
2. a minimum of 15 term courses in the Faculty of Arts,
3. the Faculty of Arts Group A and B requirements (see below).
Students in the four-year General Non-major program may graduate upon completion of a minimum of 40 term courses with a passing mark in each, including:
1. a minimum of 25 term courses beyond the 100-level,
2. a minimum of 25 term courses in the Faculty of Arts,
3. the Faculty of Arts Group A and B requirements (see below).
Both the three-year and the four-year Non-major programs require a cumulative average of 60% for graduation with an average of 65% in Arts Faculty courses.

Honours Program
Students in an Honours program must complete 40 to 48 term courses (as specified in a departmental Honours program), of which 16 term courses or their equivalent must be beyond the 100 level, with a passing mark in each and an overall cumulative average in the Honours discipline of at least 75%. The Faculty of Arts Group A and B requirements (see below) must also be met. Students are asked to refer to "Departmental Programs" for other departmental requirements.

Term Course System
A term course lasts one academic term (fall, winter, or spring) and carries a minimum of one-half credit (0.5). A course carrying 0.75 credit weight is counted as one term course. Two 0.75 credit courses are equivalent to two term courses. Courses with a 0.25 credit weight may be accumulated in pairs to equal one term course to a maximum of two term courses. Only the first four 0.25 credit courses appearing on the student's record are included in term course and average calculations.

English Language Proficiency Program
In order to identify and help those students who lack the basic writing skills required for university work, the Faculty of Arts has introduced an English Language Proficiency Program. This Program comprises 1) an English Language Proficiency Examination which all students must write at the beginning of their first year in the Faculty of Arts; and 2) a Writing Clinic where students may receive individual help with their writing problems.
All students whose initial registration in degree programs in the Faculty of Arts was Fall 1977, or thereafter, must demonstrate competence in written English in order to qualify for the Bachelor of Arts degree. Students may fulfill this requirement by achieving a mark of at least 60% on the English Language Proficiency Examination or by demonstrating this competence in their Writing Clinic assignments.
Students who receive a mark below 60% on the English Language Proficiency Examination should attend the Writing Clinic. Students who do not fulfill the English Language Proficiency requirement by the beginning of their second year must attend the Writing Clinic.
Students entering the Faculty of Arts in the Fall of 1990 or after and who have achieved 80% or better on an OAC English course are exempt from the proficiency program requirements.

English Language Proficiency Program – Off-Campus Students
When students who are completing all their Arts degree requirements through Correspondence courses or at off-campus centres have finished 15 of their 30 term courses toward the General BA, they will be required to sit the English Language Proficiency Examination during a normally scheduled examination time at a convenient location.

Group A and B Requirements
All Arts students must meet the Faculty of Arts Group A and B requirements. Group A comprises courses in the humanities, and Group B comprises courses in the social sciences:

Group A (i) English, History, Philosophy
Group A (ii) Croatian, Chinese, Dutch, French, German, Greek, Italian, Japanese, Latin, Polish, Russian, Spanish, Ukrainian.
(See Notes)
Group A (iii) Classical Studies, Drama, Fine Arts, Music, Religious Studies
Group B Anthropology, Economics, Geography, Political Science, Psychology, Sociology.
Only courses taken in the subjects listed above will satisfy the Group A and B requirements.

In order to complete the Group A and B requirements an Arts student must complete with passing marks a minimum of six term courses from Group A and a minimum of four term courses from Group B. Of the four term courses used to satisfy the Group B requirement, no more than two may be in the same discipline. A student may take more than two term courses in a specific discipline in Group B but only two of them will be applied to meet the four course requirement. The student should note that Group A is further sub-divided into Group A (i), Group A (ii), and Group A (iii). Of the six term courses from Group A, the student must complete with passing marks:
- a minimum of two term courses from Group A (i),
- a minimum of two term courses from Group A (ii),
- a minimum of two term courses from any of the subjects listed in A (i), A (ii) or A (iii).
Notes
2. Arts students should note that they may elect to meet the Group A (ii) requirement in their second or subsequent years by completing with passing marks two of the following courses: FR 291, FR 292, GER 271, GER 272, RUSS 271, RUSS 272, SPAN 217, SPAN 218, CLAS 201, CLAS 202, ITAL 291, ITAL 292, or EASIA 201R. These courses are taught in English and are not open to first year Arts students. These courses are the only approved alternatives to the A (ii) requirement.
3. ARTS 301: Studies in the Humanities may be used as a term course in Group A (i)

Examinations and Standings

The following regulations govern final examinations and standings in the Faculty of Arts. These regulations also apply to students in part-time and special programs. Further details concerning University Examination Regulations can be found in Chapter 1, page 1:8.

Students should note that the Faculty of Arts operates under a course system in which student progress is measured by courses successfully completed rather than by years. Students who have successfully completed fewer than ten term courses are considered Year One students; those who have successfully completed at least ten term courses but fewer than 20 will be considered Year Two students; those with at least 20 but fewer than 30, Year Three; and those with 30 or more, Year Four.

Final Examinations
1. The Faculty of Arts constitutes the examining body for all examinations. When a final written examination is required it is normally held at the end of the course. Oral examinations may be required at the discretion of individual departments. The normal time for written examinations is three hours.
2. In all courses each student is required to submit, in such form and at such time as may be determined by the instructor, evidence of satisfactory participation in term work. The marks obtained for such work during the term may be used, in part or in whole, in determining grades. At the discretion of the Department Chair concerned and of the Dean, a student may be barred from the final examination if the course requirements are not completed to the satisfaction of the instructor.

Arts

Degree Requirements
Examinations and Standings

3. Failure to write an examination may be considered a failure to pass. A student who defaults a final examination, except for a properly certified reason, shall have no make-up examination privileges. If a student fails to write for medical reasons, a Doctor's certificate, covering the precise period of absence, must be filed in the Registrar's office within a reasonable period of time after the examination should have been written.

4. No instructor shall be permitted to administer and no student shall be required to sit final examinations in the formal lecture period.

5. Normally instructors may not hold major term tests in the last five teaching days of the lecture schedule in any term. Major term tests are those which account for more than 25% of the final course grade.

Grading System

1. Normally all courses should be completed within the term in which they are offered. Letter grades are used to signify evaluation in individual courses.

   For the purpose of calculating averages, the following weights will be assigned to grades received in individual courses:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>A+</td>
<td>95</td>
</tr>
<tr>
<td>A</td>
<td>89</td>
</tr>
<tr>
<td>A-</td>
<td>83</td>
</tr>
<tr>
<td>B+</td>
<td>78</td>
</tr>
<tr>
<td>B</td>
<td>75</td>
</tr>
<tr>
<td>B-</td>
<td>72</td>
</tr>
<tr>
<td>C+</td>
<td>68</td>
</tr>
<tr>
<td>C</td>
<td>65</td>
</tr>
<tr>
<td>C-</td>
<td>62</td>
</tr>
<tr>
<td>D+</td>
<td>58</td>
</tr>
<tr>
<td>D</td>
<td>55</td>
</tr>
<tr>
<td>D-</td>
<td>52</td>
</tr>
<tr>
<td>E+</td>
<td>46</td>
</tr>
<tr>
<td>E</td>
<td>43</td>
</tr>
<tr>
<td>F</td>
<td>38</td>
</tr>
</tbody>
</table>

   Overall standing is determined by the cumulative average of grades assigned for all courses taken at the University (at any time, whether passed or failed) while registered in a degree program in the Faculty of Arts.

Note

When a course is repeated, the two marks are not averaged together. Rather, both marks are entered with all other marks in calculating the student's cumulative overall average. A passed course may be repeated once with the approval of the department concerned.

2. Students may request that their performance in any given Arts course be marked as either Credit (Cr) or Fail (F). The instructor of the course and the student's department must agree to this arrangement at the outset of the course and the student must communicate the decision in writing to the Arts Faculty Examinations and Standings Committee before the end of the three week drop period.

   In satisfaction of the minimum degree requirements students in General programs may present up to six term courses with a grade of Credit (Cr) in courses outside their major. Students in Honours programs may present up to eight term courses with a grade of Credit (Cr) in courses outside their Honours area.

   Students considering teaching careers should especially note that the Ministry of Education will not accept courses with credit grades as satisfying the minimum requirements in defined specialist fields.
3. An incomplete (INC) may be assigned by an instructor in exceptional circumstances, with the consent of the department. This extension of completion date is granted to students as a privilege for a limited and specified time and in normal circumstances shall be no longer than three months.

Students should make themselves familiar with the internal procedures established by their major department in handling incomplete courses. This is particularly important in that a student with outstanding incompletes on his/her record will be given Conditional Standing and will not be able to graduate until the INC has been replaced by a letter grade.

4. Students may request to register for Audit (AUD) in a course. No credit is granted for a course in which an AUD grade is awarded. Students interested in an Audit must consult with the course instructor at the beginning of the course to ascertain what conditions are attached to the granting of an AUD by the course instructor.

5. There are a number of courses in the Faculty of Arts which are essentially year courses (of two term duration) although they are listed as two separate term courses. Letter grades are not awarded until the second half of the course is complete and then the same grade is applied to both term courses. An In Progress (IP) grade is assigned to the first term course until a grade is designated for the second term course.

The use of the IP grade is normally limited to 400-level courses which are Senior Honours Essay or Senior Seminar courses and which normally require eight months or so to complete. The grade may be used in other courses only with the prior approval of the Undergraduate Affairs Group of the Arts Faculty.

6. A grade of WD (withdraw after the course drop deadline) may be assigned by the Arts Faculty Examinations and Standings Committee. This grade is used when it is not appropriate to completely remove a course from a student’s record and not in the academic interests of the student to continue with the course.

The WD grade has no effect on average or credit calculations.

7. Some courses which are listed under separate labels or numbers have overlapping content. Only one of these courses may be taken for credit. These are designated with notes after the courses which would indicate one of the following:

- the courses are cross-listed;
- credit will only be granted for one of a pair of courses;
- a course formerly was designated with a different number and/or label.

A student who enrolls in a course which seems to have overlapping content with another course should consult his/her Undergraduate Officer to be certain that credit will be awarded for both courses.

The following table indicates sets of statistics or research methods courses which have overlapping content. A student in an Arts Faculty program may take only one course from each set for credit.

<table>
<thead>
<tr>
<th>Set A - Basic Statistics Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>*No longer offered</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Set B - Advanced Statistics Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 461, ENV S 278, PSYCH 202*, PSYCH 391, STAT 205*, STAT 304, STAT 321</td>
</tr>
<tr>
<td>*No longer offered</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Set C - Research Methods Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>*No longer offered</td>
</tr>
</tbody>
</table>

Course Load

Except for students in Joint Honours programs and Honours programs where six term courses per term may be required, the normal full-time course load per term is five term courses. Students in programs other than Joint Honours programs and Honours programs as indicated above may take six courses by permission of their Undergraduate Advisor provided that they have an overall average, which includes a minimum of ten term courses from the Faculty of Arts, of 75% or better. Students with less than 75% require the permission of the Examinations and Standings Committee before enrolling in the sixth course.

Note

*Petitions to drop a sixth course will not be given favourable consideration.*

Correspondence Courses

Because of the different start dates and the different final exam periods for correspondence and on-campus courses, students enrolled in full-time on-campus courses must have the permission of their Undergraduate Advisor and the Examinations and Standings Committee to register for a correspondence course.

Part-Time Studies

Students may pursue degree studies part-time (in most General and Honours programs) by enrolling in one or two regularly scheduled courses meeting in either the day or evening. In addition, courses may be taken in the six-week summer program or by correspondence. A number of programs are available by correspondence (see the University of Waterloo Correspondence Calendar). There is no distinction between part-time and full-time students as to admission requirements, grading practices, or promotion policies.
Standing

1. To be considered in good standing in a General program, a student must maintain a cumulative overall average of at least 60%, as well as an average of at least 65% in all courses taken in the Major discipline (unless the department specifies a higher average). If a student's overall average falls between 58 and 60%, or the major or non-major average falls below 65% (unless the department specifies a different average), the student may be granted conditional status for one academic term. During this period the student must make reasonable progress toward obtaining good standing or the student will be required to withdraw from the Faculty of Arts.

2. To be considered in good standing in an Honours program, a student must maintain a cumulative overall average of at least 60%, as well as an average of at least 75% in all courses taken in the Honours discipline (unless the department specifies a higher average). A student in a Joint Honours program must maintain a cumulative average of 75% in all courses taken in the two Honours disciplines (unless the departments specify other averages). If an Honours degree candidate's major average falls below the prescribed minimum the candidate will be considered for the General degree and the regulations in (1) above will apply. If subsequently the student raises the average to the required level, he/she may, through the Department Chair, petition the Examinations and Standings Committee to review his/her case.

3. Even while otherwise in good standing, a student who fails four or more term courses in any academic year (ten term courses or fewer) may be required to withdraw if the Examinations and Standings Committee considers that the student will not profit by further study.

4. A student who has been required to withdraw for academic reasons is eligible to apply for re-admission after an absence of two terms. If such a student is re-admitted, previous course work does not count in the cumulative average; however, all previous course attempts remain recorded on the student's University transcript.

5. Students whose cumulative average(s) has been cleared as in (4) above will be required to complete a minimum of ten additional courses whether or not this will bring the total number of courses in excess of the number required.

6. Students may withdraw before the final day of classes without penalty to their records; however, students who withdraw to avoid a number of failures will likely be ineligible for re-admission for at least two terms.

Dean's List

To recognize outstanding academic achievement the Arts Faculty has established a Dean's List. To be eligible for the Dean's List a student:

- must have completed a minimum of ten UW courses which count in the cumulative average,
- must have a cumulative overall average of 83.0 or higher,
- may not have any INCs or NMRs.

When a student receives Dean's List standing, it is noted on the transcript.

Appeal Procedures

If a student wishes to appeal a grade, academic status or standing, the student should (as soon as possible and at the latest within six months of receipt of the grade or decision) try to work the matter out informally with the instructor, officer or University authority concerned. If the problem cannot be resolved in this way, the student may submit an Application for Formal Inquiry to the Associate Dean for Undergraduate Affairs of the student's faculty of registration. Students registered through a church college should submit the appeal through the Dean of the College.

Whether or not a student wishes to proceed informally or formally, advice and assistance may be secured either from the office of the Associate Dean for Undergraduate Affairs, Registrar's Office, University Secretariat, and/or the Ombudsperson.

See page 1:10 for more information on the Student Appeals Policy and Procedure.

Petition Procedures

A petition should be used in those instances where a student seeks relief from normal Faculty or University rules and regulations because of special circumstances such as illness or bereavement.

Types of requests include requests to: drop or add courses after the deadline; withdraw without academic penalty; take a course at another university; take an additional course above the specified maximum for a program; substitute for a required course; or reconsider an academic decision.

A statement from a physician, counsellor, etc., must accompany all petitions based on health related grounds. Similarly, an employer's statement is required for petitions based on work commitments, etc.

Petition forms are available at departmental undergraduate offices, the Arts Faculty Undergraduate Office and the Registrar's Office.
Departmental Programs

School of Accountancy

Professionally Accredited Stream (PAS)
The accounting programs in the Faculty of Arts anticipate the students' completion of a five-year integrated and professionally accredited course of study and work, leading to both a Bachelor of Arts degree and a Master of Accounting degree. Students may opt to complete only the undergraduate portion of the program. Only completion of the entire five-year program, however, will lead to fulfillment of the requirements of the Institute of Chartered Accountants of Ontario or the Society of Management Accountants of Ontario which qualify the student for exemptions from other requirements, as described in the section Special Recognition by the Accounting Profession of the Professionally Accredited Stream.
The Bachelor's portion of the PAS program is described below. Further details of the Master's program (Terms 5A and 5B) are found in the Graduate Calendar.

Students may earn a Bachelor of Arts degree in accounting in Honours Chartered Accountancy Studies Co-op or Honours Management Accountancy Studies Co-op by registering in either Honours Chartered Accountancy Studies or Honours Management Accountancy Studies as outlined below. All accounting programs are co-operative, involving both academic study and practical work experience. The programs are designed to help students integrate effectively both these aspects. Students should apply for direct admission to Year One Honours Accountancy Studies Co-op and indicate either Chartered Accountancy or Management Accountancy Studies.

Recommended Program – Honours Chartered Accountancy Studies

<table>
<thead>
<tr>
<th>Term 1A</th>
<th>Term 1B</th>
<th>Term 2A</th>
<th>Term 2B</th>
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</thead>
<tbody>
<tr>
<td>ECON 101M</td>
<td>ECON 102M</td>
<td>ECON 201 or</td>
<td>5 electives</td>
</tr>
<tr>
<td>MATH 113A</td>
<td>CS 100</td>
<td>STAT 211</td>
<td></td>
</tr>
<tr>
<td>ACC 131</td>
<td>ACC 251</td>
<td>ACC 291</td>
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</tr>
<tr>
<td>2 electives</td>
<td>1 elective</td>
<td>ACC 241</td>
<td>ACC 381</td>
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<table>
<thead>
<tr>
<th>Term 3A</th>
<th>Term 3B</th>
<th>Term 4A</th>
<th>Term 4B</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT 311</td>
<td>ACC 371</td>
<td>ACC 372</td>
<td>ACC 401</td>
</tr>
<tr>
<td>ACC 392</td>
<td>ACC 443 or</td>
<td>ACC 382</td>
<td>ACC 491</td>
</tr>
<tr>
<td>ACC 461</td>
<td>PHIL 443</td>
<td>ACC 442</td>
<td>ACC 463</td>
</tr>
<tr>
<td>ENGL 210 or</td>
<td>ACC 432</td>
<td>ACC 451</td>
<td>2 electives</td>
</tr>
<tr>
<td>another</td>
<td>ACC 462</td>
<td>1 elective</td>
<td></td>
</tr>
<tr>
<td>English course</td>
<td>1 elective</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Masters Program*

<table>
<thead>
<tr>
<th>Winter</th>
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</thead>
<tbody>
<tr>
<td>ACC 601</td>
<td>ACC 630</td>
</tr>
<tr>
<td>ACC 611</td>
<td>ACC 650</td>
</tr>
<tr>
<td>ACC 651</td>
<td>ACC 698</td>
</tr>
<tr>
<td>2 electives</td>
<td>2 electives</td>
</tr>
</tbody>
</table>

* For entry into this phase of the PAS, students must meet all normal graduate school entry requirements. Please see Graduate Calendar for details.

Recommended Program – Honours Management Accountancy Studies

<table>
<thead>
<tr>
<th>Term 1A</th>
<th>Term 1B</th>
<th>Term 2A</th>
<th>Term 2B</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECON 101M</td>
<td>ECON 102M</td>
<td>M SCI 211</td>
<td>M SCI 311</td>
</tr>
<tr>
<td>MATH 113A</td>
<td>ACC 280</td>
<td>ACC 231</td>
<td>BUS 352</td>
</tr>
<tr>
<td>CS 100</td>
<td>ACC 251</td>
<td>ACC 241</td>
<td>STAT 211</td>
</tr>
<tr>
<td>2 electives</td>
<td>ACC 291</td>
<td>ACC 381</td>
<td>ECON 201 or</td>
</tr>
<tr>
<td>1 elective</td>
<td>1 elective</td>
<td>ECON 202</td>
<td>1 elective</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Term 3A</th>
<th>Term 3B</th>
<th>Term 4A</th>
<th>Term 4B</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT 311</td>
<td>ACC 371</td>
<td>ACC 372</td>
<td>ACC 401</td>
</tr>
<tr>
<td>ACC 392</td>
<td>ACC 443 or</td>
<td>ACC 382</td>
<td>ACC 491</td>
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<tr>
<td>ACC 461</td>
<td>PHIL 443</td>
<td>ACC 442</td>
<td>ACC 463</td>
</tr>
<tr>
<td>ENGL 210 or</td>
<td>ACC 432</td>
<td>ACC 451</td>
<td>2 electives</td>
</tr>
<tr>
<td>another</td>
<td>ACC 462</td>
<td>1 elective</td>
<td></td>
</tr>
<tr>
<td>English course</td>
<td>1 elective</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* For entry into this phase of the PAS, students must meet all normal graduate school entry requirements. Please see Graduate Calendar for details.

Eligibility for the degree of Bachelor of Arts in the Honours Accountancy Studies Co-op program requires:

1. Successful completion of a minimum of 40 term courses including the Faculty of Arts requirements with an overall cumulative average of at least 60% and a cumulative average of at least 70% in all required courses listed in (2) below, and all electives labelled accounting (ACC). (Students contemplating the five-year professionally accredited stream (PAS) should note that graduate school entry requirements are more stringent than the above. An overall average of 75% is required for entry into the final phase of the PAS program.)
2. Successful completion of the following courses:
   a) ACC 231, 241, 251, 291, 371, 381, 382, 392, 401, 432, 442, 443, 461, 462. Students who have not
      completed an OAC in accounting may be required to take ACC 101 before taking ACC 291.
   b) ECON 101, 102 and 201 or 202.
   c) PHIL 215, ENGL 210 or another English writing course, one English literature elective.
   d) STAT 211, 311
   e) CS 100
   f) MATH 113A. Students who have not completed an OAC in calculus may be required to take MATH 104
      before taking MATH 113A. Students who have not completed finite mathematics or algebra and
      geometry will normally be required to complete MATH 103.
   g) For Honours Chartered Accountancy Studies Co-op:
      i) PSYCH 101, PSYCH 338
      ii) ACC 131, 451, 463, 491
   h) For Honours Management Accountancy Studies Co-op:
      i) MSCI 211, 311, 432
      ii) BUS 352
      iii) ACC 280, 454

For information about the Master of Accounting phase of the PAS program, please refer to the Graduate
Calendar.

At the end of the Honours Chartered Accountancy Studies Co-op program, the student will have completed most of
the formal university courses required at present by the Institute of Chartered Accountants of Ontario (ICAO). The
other principal requirements for qualification as a CA, as stated by the ICAO, are work experience with a public
accounting firm, passing of or being exempted from the ICAO's admission examinations, successful completion of
the ICAO's Professional Summer School (offered in May-June by the ICAO) and successful completion of the
Uniform Final Examinations.

At the end of the 4A academic term of the Honours Management Accountancy Studies Co-op program, the student will have completed the formal university courses required to challenge the Professional Studies Entrance Examination of the Society of Management Accountants of Ontario. Successful completion of that examination will enable students to enter Year One of the Society's Professional Program.

There are five work terms available in each program: students complete one, two or three terms on campus and
then alternate work terms and academic terms until the program is completed (see page 5:3 for specific
sequences). Work-term placements are in an accounting setting in the public and private sectors. Admission to this
program requires Canadian Citizenship or Permanent Residence Status in Canada.

Special Recognition by the Accounting Profession of the Professional Accredited Stream
The five-year professionally accredited stream is the only one in Ontario that has been accredited by the Institute of
Chartered Accountants of Ontario as being sufficiently complete to justify special status for its graduates.
Graduates are granted exemption from all ICAO education requirements (including the accounting, auditing and
taxation admission examinations and the ICAO Professional Summer School) except the Uniform Final
Examination (UFE) which can be written at the first opportunity following graduation from the PAS.

Similarly, the Society of Management Accountants of Ontario provides distinct recognition for students
completing the Professionally Accredited Studies program in management accounting. Students are able to
significantly reduce the length of time to professional certification by being able to concurrently register for the
Professional Program of the SMAO and the PAS program and by challenging the Entrance Examination while
enrolled as a student at the University.

Anthropology

(Anthropology includes Archaeology, Socio-Cultural Anthropology, Physical Anthropology, and Linguistics.)

Three-Year General Anthropology
Eligibility for graduation in the Three-Year General Anthropology program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 30 term courses including Faculty of Arts Group requirements
   with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.
2. At least ten term courses must be in Anthropology. ANTH courses must include: 101, 102, 201, 202, 260, 280, 352.

Four-Year General Anthropology
Eligibility for graduation with a Four-Year General degree in Anthropology includes the following requirements:

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements
   with a cumulative overall average of at least 60% and a cumulative major average of at least 65%.
2. At least 16 term courses must be in Anthropology and must include the courses required in the Three-Year
   General program.

Honours Anthropology
Eligibility for graduation in the Honours Anthropology program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements
   with a cumulative overall average of at least 60% and a cumulative major average of at least 65%.

Special Recognition by the Accounting Profession of the Professional Accredited Stream
The five-year professionally accredited stream is the only one in Ontario that has been accredited by the Institute of
Chartered Accountants of Ontario as being sufficiently complete to justify special status for its graduates.
Graduates are granted exemption from all ICAO education requirements (including the accounting, auditing and
taxation admission examinations and the ICAO Professional Summer School) except the Uniform Final
Examination (UFE) which can be written at the first opportunity following graduation from the PAS.

Similarly, the Society of Management Accountants of Ontario provides distinct recognition for students
completing the Professionally Accredited Studies program in management accounting. Students are able to
significantly reduce the length of time to professional certification by being able to concurrently register for the
Professional Program of the SMAO and the PAS program and by challenging the Entrance Examination while
enrolled as a student at the University.

Anthropology

(Anthropology includes Archaeology, Socio-Cultural Anthropology, Physical Anthropology, and Linguistics.)

Three-Year General Anthropology
Eligibility for graduation in the Three-Year General Anthropology program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 30 term courses including Faculty of Arts Group requirements
   with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.
2. At least ten term courses must be in Anthropology. ANTH courses must include: 101, 102, 201, 202, 260, 352.

Four-Year General Anthropology
Eligibility for graduation with a Four-Year General degree in Anthropology includes the following requirements:

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements
   with a cumulative overall average of at least 60% and a cumulative major average of at least 65%.
2. At least 16 term courses must be in Anthropology and must include the courses required in the Three-Year
   General program.

Honours Anthropology
Eligibility for graduation in the Honours Anthropology program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements
with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.

2. At least 20 term courses must be in Anthropology. ANTH courses must include:
   a) 101, 102, 201, 202, 260, 300, 352, 499A/B;
   b) one additional 400-level term course.

Anthropology Joint Honours Program
Joint Honours programs have been approved for Anthropology and:
Classical Studies Geography
Drama and German
Theatre Arts History
English Political Science
Environment and Psychology
Resource Studies Religious Studies
French Sociology

Eligibility for graduation in the Joint Honours Anthropology program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.

2. At least 14 term courses must be in Anthropology. ANTH courses must include:
   a) 101, 102, 201, 202, 260, 300, 352;
   b) one 400-level term course;
   c) 499A/B (the Anthropology Honours Essay) is recommended, but is optional if an Honours Essay is written in the Joint discipline.

Honours Anthropology (Co-op)
Co-op Anthropology students will pursue a normal first year Arts program, taking ANTH 101 and ANTH 102. In the second year and thereafter the student is required to pursue a normal Honours program. It is strongly advised that ANTH 300 be taken in the second year.

Students are admitted to the program in their 2A term. Their first work term follows 2B. Work terms and study terms alternate after that. A student must complete four successful work terms.

Honours Anthropology (Applied Studies Co-op)
Students may combine an Honours Anthropology program with Applied Studies Co-op. The requirements in Anthropology are identical to the Honours requirements listed above. The Applied Studies requirements are listed on pages 9:11 and 9:12.

Minor in Anthropology
An Honours student may Minor in Anthropology. The requirements for an Anthropology Minor are identical to the requirements for a Three-Year General BA in Anthropology.
Year 3B
One of SCI 261Z, 263, 265, 267 or other approved Science course
Major Subject and Electives (four or five term courses)

Year 4A
Major Subject and Electives (five or six term courses)

Year 4B
Major Subject and Electives (five or six term courses)

Notes
1. Students must normally have an overall average of 75% in their Applied Studies courses in the first term of Year One (1A) to remain in the program.
2. Once a major has been chosen at the end of Year One, students must maintain an average of at least 75% both in the major field of specialization and in the Applied Studies courses.
3. Arts Administration, French Teaching, International Trade, Management and Personnel Studies specializations are available for qualified applicants at the beginning of the 2A term. Details in HH 146.
4. A list of approved Applied Studies courses is available from the Director of the program in HH 146.
5. Double-counting courses for credit in Applied Studies and the major subject is not allowed except when a course is a specified requirement for both. Double-counting courses for credit in Applied Studies and a minor or option is allowed to a maximum of one-third of the total number of courses required for that minor or option.
6. Upon successful completion of the 44 term courses required in this program and a minimum of four successful work terms, a student is granted an Honours degree in the major discipline with an Applied Studies Co-operative program designation.

Classical Studies
(Latin, Greek, Classical Studies)

Three-Year General Programs
Eligibility for graduation in the General Latin, Greek or General Classical Studies program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 30 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.
2. At least ten term courses must be in the major field. In the Latin or Greek programs, normally not more than two of the ten may be in Classical Studies. In the Classical Studies program, normally not more than two of the ten may be in Latin or Greek; the ten must also include CLAS 251/252, 265 or 266, and at least two term courses at the 300-level. Knowledge of neither Latin nor Greek is required to obtain a General degree in Classical Studies.

Four-Year General Program
Eligibility for graduation in the Four-Year General Classical Studies program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.
2. At least 14 term courses must be in Classical Studies, including CLAS 251/252, 265 or 266, and at least two term courses at the 300-level. Normally not more than four of the 14 term courses may be in Latin or Greek.

Honours Programs
Eligibility for graduation in the Honours Classical Studies, Classical Studies (Languages Option) or Latin program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.
2. At least 20 term courses must be in the major field. In the Latin program, normally not more than six of the 20 term courses are Classical Studies courses. In the Classical Studies program, the 20 term courses must include: CLAS 251/252, 265 or 266; one senior seminar; at least seven term courses in LAT and/or GRK, including one at the 300-level; CLAS 490A/B (Senior Honours Thesis) or two equivalent term courses in Directed Study (see Notes). In Classical Studies (Languages Option), the 20 term courses must include: CLAS 251/252; at least 14 term courses in LAT and GRK, including one 300-level term course in both, and a 400-level term course in one; CLAS 490A/B (Senior Honours Thesis) or two equivalent term courses in Directed Study.

Honours Classical Studies
Recommended Program

Year One
Two of CLAS 100/101/102
LAT 100A/B or GRK 100A/B
Six additional term courses

Year Two
CLAS 251/252; 265 or 266
One additional CLAS
Two 200-level term courses in LAT/GRK
Four additional term courses
Year Three
One 300-level term course in LAT/GRK
Two additional term courses in LAT/GRK
Three CLAS or Directed Study
Four additional term courses

Year Four
Two CLAS including one senior seminar
CLAS 490A/B or Directed Study
Six additional term courses

Honours Classical Studies (Languages Option)
Recommended Program
Year One
LAT 100A/B or LAT 203/204
GRK 100A/B
Six additional term courses

Year Two
Two LAT, two GRK
CLAS 251/252
Four additional term courses

Year Three
Four term courses in LAT/GRK, including one 300-level term course in each
Two additional CLAS or LAT/GRK, or Directed Study
Four additional term courses

Year Four
CLAS 490A/B or Directed Study
One 400-level term course in LAT/GRK
One additional term course in CLAS or LAT/GRK
Six additional term courses

Honours Latin
Recommended Program
Year One
LAT 100A/B or 203/204
Eight additional term courses

Years Two, Three, Four
Four term courses in LAT
Two term courses in CLAS
Four additional term courses

Honours Classical Studies or Latin (Applied Studies Co-op)
A student may combine an Honours Classical Studies or Latin program with Applied Studies Co-op. The requirements in Classical Studies or Latin are identical to the Joint Honours requirements listed below. The Applied Studies requirements are listed on pages 9:11 and 9:12.

Joint Honours Programs
Eligibility for graduation in the Joint Honours Classical Studies, Classical Studies (Languages Option) or Latin program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 44 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.

2. At least 16 term courses must be in the major field. In the Latin program, normally not more than four of the 16 term courses are Classical Studies courses. In the Classical Studies program, the 16 term courses must include: CLAS 251/252; 265 or 266; at least five term courses in LAT/GRK; CLAS 490A/B or Directed Study (see Notes), or a senior Honours thesis in the other discipline. In Classical Studies (Languages Option), the 16 term courses must include: at least 12 term courses in LAT/GRK, including at least four term courses in each language; CLAS 251/252; CLAS 490A/B or Directed Study, or a senior Honours thesis in the other discipline.

Joint Honours Classical Studies
Recommended Program
Year One
Two of CLAS 100/101/102
LAT 100A/B or GRK 100A/B
Six additional term courses

Year Two
CLAS 251/252; 265 or 266
Two term courses in LAT/GRK
Seven additional term courses

Year Three
One term course in LAT/GRK
Three CLAS (one may be Directed Study)
Eight additional term courses

Year Four
CLAS 490A/B or Directed Study
One additional CLAS
Seven additional term courses

Joint Honours Classical Studies (Languages Option)
Recommended Program
Year One
LAT 100A/B or LAT 203/204
GRK 100A/B
Six additional term courses

Year Two
Two LAT, two GRK
CLAS 251/252
Six additional term courses

Year Three
Three term courses in LAT/GRK
One additional term course in LAT/GHK or CLAS or Directed Study
Eight additional term courses
Notes For All Honours Classical Studies Programs
1. Students in Classical Studies may take more LAT/GRK courses than the prescribed minimums. The decision whether to graduate in Classical Studies or in Classical Studies (Languages Option) may be left until registration in the final year.
2. Beginning in the second half of third year, students may with the help of the Assistant Undergraduate Advisor design proposals for Directed Study. Between two and five term courses in CLAS/LAT/GRK may be taken by Directed Study (between two and three in the case of Joint Honours), of which two would take the place of CLAS 490A/B (Senior Honours Thesis). For further details consult the Department.
3. In CLAS 490A/B a grade of B- or higher must be achieved; in Directed Study an average of B- or higher must be achieved in the equivalent of two 400-level courses.
4. CLAS courses were formerly designated C CIV.

Minor Programs
Minor programs are offered in Classical Studies, Greek and Latin. Students interested in planning a sequence of ten term courses to complement their Major field of study are encouraged to consult the Undergraduate Advisor in Classical Studies. All Minor programs must be approved by the Department.

Drama and Theatre Arts

General Drama and Theatre Arts
Eligibility for graduation in the General Drama and Theatre Arts program includes fulfillment of the following requirements:
1. Successful completion of a minimum of 30 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.
2. At least 12 term courses must be in Drama and Theatre Arts, including:
   a) DRAMA 101 A, 101 B and 102 must be taken in the first year;
   b) Dramatic Literatures: any three of DRAMA 251, 259, 311, 312, 313, 314, 315, 316, 380, 381, 382, 383, 384, 385; ENGL 362, 363, 190;
   c) DRAMA 243, 244, 371 or 372, 409.

Honours Drama and Theatre Arts
The Honours program is designed so that a student can work through a particular sequence of courses in one field (acting, academic, directing, technical). The optional DRAMA 499 project in the fourth year may be centred on this specialization.
Eligibility for graduation in the Honours Drama and Theatre Arts program includes fulfillment of the following requirements:
1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.
2. At least 20 term courses must be in Drama and Theatre Arts including:
   a) DRAMA 101 A, 101 B and 102 must be taken in the first year;
   b) Dramatic Literatures: any six of DRAMA 251, 259, 311, 312, 313, 314, 315, 316, 380, 381, 382, 383, 384, 385;
   c) DRAMA 243, 244, 371, 372, 409.

Honours Drama and Theatre Arts (Applied Studies Co-op)
A student may combine an Honours Drama and Theatre Arts program with Applied Studies Co-op. The requirements in Drama and Theatre Arts are identical to the Drama and Theatre Arts Joint Honours program listed below, with the following exceptions:
1. Both DRAMA 371 and 372 and three Dramatic Literature, OR
2. One of DRAMA 371 and 372 and four Dramatic Literatures.

Drama and Theatre Arts Joint Honours Program
Eligibility for graduation in the Joint Honours Drama and Theatre Arts program includes fulfillment of the following requirements:
1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.
2. At least 15 term courses must be in Drama and Theatre Arts including:
   a) DRAMA 101 A, 101 B and 102 must be taken in the first year;
b) Dramatic Literatures: any three of DRAMA 251, 259, 311, 312, 313, 314, 315, 316, 380, 381, 382, 383, 384, 385; ENGL 362, 363;
c) DRAMA 243, 244, 371, 372, 409.

Minor Program
DRAMA 101A and 101B and DRAMA 102 plus seven other term courses of which two must be in dramatic literature.

Acting Courses
1. DRAMA 102 has limited enrolment; early registration is advised. DRAMA 101A or 101B are pre- or co-requisites.
2. Auditions are required for DRAMA 221, 222, 321, 322, 421, 422.

Speech Communication

Note For All Programs
A student who has taken ENGL 362/363 may not also take ENGL 190.

Economics

Prerequisite
It is desirable that students planning to enter Economics should offer at least one OAC in mathematics (preferably calculus) or the equivalent.

Three-Year General Economics
Eligibility for graduation in the General Economics program includes fulfillment of the following requirements:
1. Successful completion of a minimum of 30 term courses including Faculty of Arts Group requirements, plus a minimum of 16 term courses beyond the 100 level, with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.
2. At least ten term courses must be in Economics. Four of these ten term courses must be at the 300-level or above. ECON courses must include:
   a) 101, 102, 201, 202, 231;
   b) 211 or 221.

Four-Year General Economics
Eligibility for graduation in the Four-Year General Economics program includes fulfillment of the following requirements:
1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements, plus a minimum of 16 term courses beyond the 100 level, with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.
2. At least 14 term courses must be in Economics. Six of these 14 ECON term courses must be at the 300-level or above plus two term courses must be at the 400-level. ECON courses must include:
   a) 101, 102, 201, 202, 231, 301, 302;
   b) 211 or 221.

HONOURS PROGRAMS

Honours Economics (Regular Program)
Eligibility for graduation in the Honours Economics program includes fulfillment of the following requirements:
1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.
2. At least 18 term courses must be in Economics, including ECON:
   a) 101, 102, 201, 202, 211, 212, 221, 301, 302, 321, 401, 402;
   b) Six additional term courses at the 300-level or above.

Recommended Program

Year One
ECON 101 and 102
Eight additional term courses*  
* Students without an OAC in Mathematics or equivalent should select MATH 103, 104 as electives.

Year Two
ECON 201, 202, 211, 221, 231
One additional term course in Economics
Four additional term courses.

Year Three
ECON 301, 302, 321
Three additional courses in Economics
Four additional term courses.

Year Four
ECON 401, 402*  
Two additional term courses in Economics
Six additional term courses.  
* ECON 401, 402, need not be taken in the order as listed.

Honours Economics Applied Studies (Co-op)
A student may combine an Honours Economics program with Applied Studies Co-op. The requirements in Economics are identical to the Honours requirements listed above. The Applied Studies requirements are listed on pages 9:11 and 9:12.

Honours Applied Economics (Co-op)
Eligibility for graduation in the Honours Applied Economics (Co-op) program includes fulfillment of the following requirements:
1. Successful completion of a minimum of 42 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.
2. At least 18 term courses must be in Economics, including ECON:
   a) 101, 102, 201, 202, 211, 221, 231, 301, 302, 321, 401, 402;
   b) 403 or 421
   c) Five additional ECON electives at the 300-level or above. ECON 311, 421 and 422 are strongly recommended for those planning on entering Economics graduate studies.

3. In addition, the following courses are required:
   a) ACC 121, 122
   b) CS 100 or 102.

Economics Joint Honours Programs
Eligibility for graduation in the Joint Honours Economics program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 44 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average (in Economics) of at least 75%.

2. At least 14 term courses must be in Economics including ECON 101, 102, 201, 202, 211, 221, 231, 301, 302, 401, 402. Students in the Joint Honours Mathematics/Economics or Economics/Mathematics program must take at least 12 term courses in Economics including ECON 101, 102, 201, 202, 231, 301, 302, 401, 402, plus three additional ECON courses at the 300-level or above.

Notes For Joint Honours Programs
1. Economics and Geography
   The degree requirements of the Faculty of Arts must be met for the BA degree and those of the Faculty of Environmental Studies for the BES degree. Students must take ECON 221 or ENV S 271 and the above core courses.

2. Economics and Mathematics
   Substitute ECON 311, 321, for ECON 101, 211.
   Students in Years One and Two may take this program in either Faculty, but at the end of the second year, they will decide whether to continue towards a degree in Arts or a degree in Mathematics. The program must then be approved by the Economics Department and by an appropriate department of the Faculty of Mathematics.

3. Economics and Political Science
   ECON 310 must be taken along with the above core courses.

4. Economics and Sociology
   Students may take either ECON 221 or SOC 280.

Minor Program in Economics
A total of ten term courses in Economics must be taken, and must include:
ECON 101, 102, 201, 202, 231
One of ECON 211, 221 (or an equivalent approved by the Department of Economics).

Economics Option
Students in Honours Earth Sciences may earn an Economics Option upon successful completion of the following six courses with a cumulative average (in Option courses) of at least 65%. Required courses are ECON 101, 102, 201, 355. Two additional courses are required with no more than one from each of the following groups: ECON 341 or 361
BUS 111 or 121 (WLU)
M SCI 211
a course in entrepreneurship.

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### Recommended Program for Honours Applied Economics (Co-op)

This program consists of a minimum of 42 term courses of which 18 are in economics.

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<td>CS 100 or 102</td>
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<td>Registration for Honours Applied Economics in February/March</td>
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<td>Term 2A</td>
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<td>Second Work Term</td>
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<td>ECON 301, 302</td>
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<td>ECON 401</td>
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<td>ECON 421 plus one ECON course at 300-level or above or two ECON courses at 300-level or above</td>
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<td>Fifth Work Term</td>
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<td>ECON 403 plus one ECON course at 300-level or above or two ECON courses at 300-level or above</td>
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<td>3 electives</td>
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* One of ECON 421 or 403 is required.
JOINT PROGRAM IN ECONOMIC STUDIES

Honours Biology/Business Economics
A student may combine an Honours Biology program with Business Economics. The Biology/Science requirements are listed on page 14. The requirements in Economics include fulfillment of the following:

1. Cumulative Economics averages of at least 70%.

2. At least 13 term courses in Economics including:
   - ECON 101 and 102, 201, 202, 211, 212, 231, 355 or
   - ECON 344 (WLU)*; plus 2.5 credits from ECON 301, 302, 321, 344, 345, 361, 401, 402, 403; BUS 352W (WLU)*
   *ECON 344 (WLU) Agricultural Economics
   *BUS 352W (WLU) Marketing

English

Students interested in English programs will ordinarily be admitted at the beginning of Year Two. Admission will be based on academic performance in at least ten term courses in Year One, including at least one or (preferably) two 100-level English Major courses. Application for admission to English programs is usually made at the time of preregistration for Year Two. Criteria for admission to Honours English programs will normally include an overall Year One average of at least 70% and an English average of at least 75%; to the Four-Year General English program, an overall Year One average of at least 65% and an English average of at least 70%; to the Three-Year General English program, an overall Year One average of at least 65% and an English average of at least 65%.

Because of limitations on resources, however, the student's fulfillment of minimum entrance requirements may not guarantee admission to English programs, and higher averages may be required.

Three-Year General English
Eligibility for graduation in the General English program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 30 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.

2. At least 12 term courses must be in English, including:
   - two term courses from 102A, 102B, 103A, 103B, 105A, 105B, 108, 190 (see Note 1);
   - three other English major term courses.

Honours English – Literature
Eligibility for graduation in the Honours English program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.

2. At least 20 term courses must be in English, and these 20 courses are usually divided 2:6:6:6 among the four years. English courses must include:
   - two term courses from 102A, 102B, 103A, 103B, 105A, 105B, 108, 190 (see Note 1);
   - ECON 101 and 102, 201, 202, 211, 212, 231, 355 or ECON 344 (WLU)*; plus 2.5 credits from ECON 301, 302, 321, 344, 345, 361, 401, 402, 403; BUS 352W (WLU)*
   - four term courses from 310A, 310B, 330A, 330B, 350A, 350B, 362, 363, 410A, 410B (British Literature to 1800);
   - two term courses from 430A, 430B, 451A, 451R, 460A, 460B, 460C (British Literature since 1800);
   - two term courses from 313, 314, 315, 316, 343, 344, 345, 346, 347 (North American Literature);
   - four other English major term courses.

Honours English – Rhetoric and Professional Writing
The Rhetoric and Professional Writing Option is available only as an Honours program (not as a General program) and may be taken as either a Regular program or a Co-operative program. A student must complete 42 term courses with an average of at least 75% in English courses and 70% in the Intensive Study area. In addition to English courses (English 103A/B is recommended), good course choices for first year include Arts Group B courses, a language other than English, and Computer Science.

The Intensive Study areas can be made up of courses drawn from all faculties except Engineering. The courses will be taken either from a single department (e.g. Biology, Economics) or closely related disciplines (e.g. Biology and Health Studies, Economics and Accounting, Legal Studies). Lists of approved "packages" for Intensive Study
may be obtained from the Undergraduate Officer of the Department of English, who also has lists of recommended courses relevant to the program in History, Philosophy, and Political Science.

Students preparing themselves for teaching careers or graduate studies in English may include further courses in literature as part of their electives.

**English Requirements (20 courses)**

1. First Year (two courses): two English Major courses (103A/B recommended, but students may enter RPW from any two 100-level English major courses);

2. Literature (seven courses): 200A/B, 251A/D, three further Literature (one from North American sequences; one from 310, 330, 350, 362/363, 410, 430, 451, 460 sequences; one other);

3. 200-level Writing (two courses): two of 209, 210A, 210C, 219 (choices must include at least one 210 course);


5. RPW electives (three courses): choose from among the 305 courses, other 306 courses, other 309 courses, 335/336, 470A, 481/482/492 senior seminars, 495A/B when devoted to projects in linguistics, rhetoric, professional writing, or communication (see Undergraduate Officer for current listing of approved RPW electives).

**Non-English Requirements (22 courses)**

1. Two courses in computing;

2. Two courses in a second language (Arts Group A (ii));

3. Four courses in social sciences (Arts Group B);

4. Five courses in an intensive study concentration;

5. Nine courses in open electives.

**Note to RPW students**

Because most students who choose RPW also choose the Co-op program, the pattern of RPW course selection is set up to accommodate their needs. Co-op RPW students are strongly advised to follow a fully-alternating schedule of academic and work terms. (For the details of this alternating schedule, see page 5:3 of this Calendar, as well as the term by term models in the RPW advisory materials available from the English Undergraduate Officer.) Co-op RPW students are also strongly advised not to go off-stream.

Students who wish to pursue RPW through a regular program of study, rather than through Co-op, are also welcome to enter the RPW Option. Regular RPW students, however, are strongly recommended, in order to maximize their final-year course choices, to take the two terms of their fourth year in the same sequence as do the Co-op students. (Thus, the first term of the fourth year will be Spring Term and the second term of the fourth year will be Winter Term, with the intervening Fall Term as an off-term.)

**Honours English – Literature or RPW Co-operative Program**

The program leading to the degree of Bachelor of Arts in Honours English (Co-operative Program) is designed for students who intend to enter careers in business, industry, government, or the communications media. Qualified students will ordinarily be admitted to the program after completion of their first two academic terms at the University of Waterloo and will proceed through the Honours English BA program consisting of six further terms of study on campus and a minimum of four work terms with participating employers in the media, business, government, and industry.

The academic requirements of the Co-operative program are essentially those of the regular Waterloo Honours BA in English (either Literature or RPW). Co-op students must complete, by the start of their 3A term (20 term credits), two term credits in a language other than English and two term credits in computer science at the university level from any faculty.

**Honours English – Literature or RPW Applied Studies Co-op**

Students may combine an Honours English program (either Literature or RPW) with Applied Studies Co-op. The requirements in English are identical to the Honours requirements listed above. Students must complete by the start of their 3A term (20 term credits), two term credits in a language other than English, and two term credits in computer science at the university level from any faculty. The Applied Studies requirements are listed on pages 9:11 and 9:12.

**English Joint Honours Program – Literature**

Eligibility for graduation in the Joint Honours English program includes fulfillment of the requirements listed below.

1. Successful completion of a minimum of 44 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative average in English courses of at least 75%.

2. At least 16 term courses must be in English, including:
   a) two term courses from 102A, 102B, 103A, 103B, 105A, 105B, 108, 190 (see Note 1);
   b) 200A, 200B (Survey of British Literature – see Notes 2 and 3);
   c) 251A, 251B (Practice and Theory of Criticism – see Note 3);
   d) two term courses from each of:
      iii) 430A, 430B, 451A, 451B, 460A, 460B, 460C (British Literature since 1800);
      iv) 313, 314, 315, 316, 343, 344, 345, 346, 347 (North American Literature);
   e) two other English major term courses.
English Joint Honours Program – Rhetoric and Professional Writing

The Joint Honours English Program with Option in Rhetoric and Professional Writing is intended for students who wish to pursue their Intensive Study areas very comprehensively. Students must complete 44 term courses, with an average of at least 75% in English courses.

Functional requirements (16 courses)
1. First Year (two courses): two 100-level English courses (103A, 103B recommended);
2. Literature (six courses): 200A, 200B; 251A, 251B; two other courses at 300- or 400-level;
3. RPW Core Course (one course): 292;
4. Linguistics (one course): 306A;
5. Writing and Rhetoric (five courses): two of 209, 210A, 210C, 219; one course from 309 sequence (either 309A or 309B); 409A, 490B;
6. Linguistics or Rhetoric (one course): one other course from 306 sequence or 309 sequence.

Non-English requirements (28 courses)
1. Joint honours area: 14-16
2. Language other than English: minimum of two
3. Computer science: minimum of two
4. Arts Group B: four
5. Electives: four to six

See note to RPW students above.

Minor Program for Students in Other Disciplines
Ten term courses in English are required, as follows:

1. 200A/B (Survey of British Literature);
2. 251A/B (Practice and Theory of Criticism);
3. Two English Major term courses, numbered 300 or above;
4. Four other English Major term courses.

Notes for All Programs
1. Students may use only two English term courses at the 100-level to fulfill the minimum English requirements. Some English courses do not fulfill the English Major requirements for a degree in English (see English Undergraduate Course Descriptions). Students not in the Rhetoric and Professional Writing option may take for English Major credit ENGL 335 and 336 and a maximum of two other writing courses at the 200- and 300-levels.
2. Students who have taken ENGL 101 in 1980/81 or earlier will not be required to take ENGL 200A/B. If taken, it will not count as an English Major credit.
3. ENGL 200A, 200B, 251A, 251B are strongly recommended for second year.

Fine Arts

Three-Year General Fine Arts
Eligibility for graduation in the General Fine Arts program (Studio Specialization, Art History Specialization or Film Studies Specialization) includes fulfillment of the following requirements:

1. Successful completion of a minimum of 30 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.
2. At least 12 term courses must be in Fine Arts. For the different Specializations, the required courses are as follows:

   Studio Specialization:
   a) FINE 110, 111, 120, 121, 220, 222, 224, 225;
   b) Four additional Fine Arts courses, two of which must be Art History.

   Art History Specialization:
   a) FINE 110, 111, and six additional Art History courses;
   b) FINE 120 and three additional Studio courses.

   Film Studies Specialization:
   a) FINE 110, 111, 250, 251, 270W, 470, 471;
   b) at least three term courses from: FINE 350, 351, 352, 353, 360, 361;
   c) at least two term courses to be selected in consultation with the Fine Arts Film advisor, from: FINE 252, 253, 255R, 258W, 271W, 359, 380Z, 381Z.

Four-Year General Fine Arts
Eligibility for graduation in the Four-Year General Fine Arts program (Studio Specialization, Art History Specialization, or Film Studies Specialization) includes fulfillment of the following requirements:

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.
2. At least 16 term courses must be in Fine Arts. For the different Specializations, the required courses are as follows:

   Studio Specialization:
   a) FINE 110, 111, 120, 121, 220, 222, 224, 225;
   b) Four additional Fine Arts courses, two of which must be Art History;
   c) Four term courses in Fine Arts at the third- or fourth-year level.

   Art History Specialization:
   a) FINE 110, 111, 120, 121, 210, 211, 212, 213, 219, 316;
   b) and two additional Studio term courses;
c) four term courses in Fine Arts at the third- or fourth-year level, two of which must be 390A and 490A.

Film Studies Specialization:
a) FINE 110, 111, 250, 251, 270W, 470, 471, 490A;
b) at least four term courses from: FINE 350, 351, 352, 353, 360, 361;
c) at least four term courses to be selected in consultation with the Fine Arts Film advisor, from: FINE 252, 253, 255R, 258W, 271W, 359, 380Z, 381Z.

Honours Fine Arts
To graduate with an Honours degree in Fine Arts, it is necessary to complete FINE 490/491. Admission to this course is by portfolio, Art History or Film Studies presentation, submitted after successfully completing all required third-year subjects, and maintaining an average of 75% in the major. This is to ensure that students are capable of carrying out their proposed course of study.

All other fourth-year courses are open to students who have completed their third-year courses or are otherwise qualified.

Eligibility for graduation in the Honours Fine Arts program (Studio Specialization, Art History Specialization or Film Studies Specialization) includes fulfillment of the following requirements:

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.

2. At least 20 term courses must be in Fine Arts. For the different Specializations, the required courses are as follows:

Studio Specialization:
a) FINE 110, 111, 120, 121, 220, 222, 224, 225;
b) five additional term courses in Fine Arts, four of which must be in Art History;
c) FINE 319 plus four term studio courses on the third-year level chosen from: FINE 320, 321, 322, 323, 324, 325, 326;
d) FINE 490, 491.

Art History Specialization:
a) FINE 110, 111, 120, 121, 210, 211, 212, 213, 219, 316;
b) two additional Studio term courses;
c) six term Art History courses on the second- or third-year level, one of which must be 390A;
d) FINE 490, 491.

Film Studies Specialization:
a) FINE 110, 111, 250, 251, 270W, 470, 471;
b) two term courses from: FINE 120, 121, 210, 211;
c) at least five term courses from: FINE 350, 351, 352, 353, 360, 361;
d) at least four term courses to be selected in consultation with the Fine Arts Film advisor, from: FINE 252, 255R, 258W, 271W, 359, 380Z, 381Z;
e) FINE 490, 491.

Joint Honours in Fine Arts
Joint Honours programs are possible in combination with a number of departments within the Faculty of Arts. In order to graduate in the Joint Honours Fine Arts programs, students must successfully complete a minimum of 44 term courses, including the Faculty of Arts Group requirements, with an overall cumulative average of at least 60% and a cumulative average in Fine Arts courses of at least 75%, and fulfill the requirements of the Studio, Art History or Film Studies Specialization, listed below.

Fine Arts (Studio Specialization)
a) FINE 110, 111, 120, 121, 220, 222, 224, 225;
b) two additional art history courses;
c) four term Studio courses on the 300 level chosen from: FINE 320, 321, 322, 323, 324, 325, 326;
d) FINE 490, 491.

Note
Fine Arts students should bear in mind that their area of concentration in FINE 490, 491 (painting, sculpture, drawing, printmaking, etc.) must be one in which they have completed all lower level (second- and third-year) courses.

Fine Arts (Art History Specialization)
a) FINE 110, 111, 120, 121, 210, 211, 212, 213, 316, 317;
b) two additional Studio courses;
c) six term Art History courses on the second- or third-year level chosen from: FINE 320, 321, 322, 323, 324, 325, 326;
d) FINE 490, 491.

Fine Arts (Film Studies Specialization)
a) FINE 110, 111, 250, 251, 270W, 470, 471;
b) five term courses from: FINE 350, 351, 352, 353, 360, 361, 380Z, 381Z;
c) two term courses from: FINE 252, 255R, 258W, 271W, 359;
d) FINE 490, 491.

Honours Fine Arts (Applied Studies Co-op)
A student may combine an Honours Fine Arts program with Applied Studies Co-op. The requirements in Fine Arts are similar to the Joint Honours requirements listed above but differ in important details. Please see the Faculty Advisor.

Minor in Fine Arts (Studio, Art History or Film Studies Specialization)
Eligibility for graduation with a Fine Arts Minor (Studio, Art History or Film Studies Specialization) includes fulfillment of the following requirements:

1. Successful completion of a minimum of ten Fine Arts term courses with a cumulative average in these Fine Arts courses of 65%.

2. For the different Specializations, the required Fine Arts courses are:
Arts
Fine Arts
French

Studio or Art History Specialization:
FINE 110/111, 120/121

Film Studies Specialization:

Note For All Programs
FINE 390, 391, 392, 393, 394, 472, 474 and 475 may be taken only as electives.

Fine Arts Abroad
In the spring, FINE 394 will be offered abroad, usually in Paris and Burgundy. Alternative locations will be announced.

French

Three-Year General French
Eligibility for graduation in the General French program includes fulfillment of the following requirements:
1. Successful completion of a minimum of 30 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.
2. At least 12 term courses must be in French of which at least six term courses must be at the 300- or 400-level. At least one term course must be taken in each of the following areas: 17th, 18th, 19th, 20th century literature, French-Canadian literature, and linguistics. The student must complete five term credits in French language including FR 300 and one course in French or French-Canadian civilization.

Four-Year General French
Eligibility for graduation in the Four-Year General French program includes fulfillment of the following requirements:
1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.
2. At least 16 term courses must be in French of which at least eight must be at the 300- or 400-level. Students must complete six courses in French language including FR 300 and FR 400 and one course in French or French-Canadian Civilization. At least one term course must be taken in each of the following areas: 17th, 18th, 19th, 20th century literature, French-Canadian literature, and linguistics.

Honours French
Eligibility for graduation in the Honours French program includes fulfillment of the following requirements:
1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.
2. At least 20 term courses must be in French of which at least ten term courses must be at the 300- or 400-level. At least six term courses must be taken in literature in six of the following areas: Medieval, Renaissance, 17th, 18th, 19th, 20th century French literature or French-Canadian literature. The student must complete one course in linguistics, at least six term credits in language including FR 300 and FR 400 and two courses in French or French-Canadian civilization.

Recommended Program

Year One
FR 195 and FR 196 – prerequisite for upper level literature courses
FR 192A and FR 192B – recommended
Six additional term courses

Year Two
FR 250
At least four additional term courses in French in accordance with requirements
Additional elective courses

Year Three
FR 300
At least four additional French courses in accordance with requirements
Additional elective courses

Year Four
FR 400
At least four additional French courses in accordance with requirements
Additional elective courses

Honours French (Applied Studies Co-op)
Students may combine an Honours French program with Applied Studies Co-op. The requirements in French are identical to the Joint Honours requirements listed below. The Applied Studies requirements are listed on pages 9:11 and 9:12.

French Teaching Specialization
This is a special program of study within the Applied Studies Co-op program. Students graduate with an Honours French (Applied Studies) degree from Waterloo, a BEd degree awarded by Brock University, and certification to teach French and a second subject at the secondary level, and must satisfy the respective requirements.
Candidates apply for admission to the Applied Studies program and are admitted to the French Teaching Specialization in the second year.
The following courses are required in Year One of the Applied Studies Program: ACC 123, ACC 131; one of CS 100, CS 102; ENGL 109; two courses in a Second Language (including French).
After Year One, the requirements of the Specialization differ from those of the regular Applied Studies program.
PSYCH 212 (Educational Psychology) is required; PSYCH 101 is a prerequisite and should be taken in Year One. Students who do not already have a native fluency in French are required to spend two terms (normally in Year Three) at a French-speaking University.

Students must complete all the requirements for the French Honours Degree (20 term courses) as outlined above, but must also include two of the following courses: FR 203, 303, 403; a course in Quebec civilization if the third year is taken at a university in Europe; a course in French civilization if the third year is taken at a Quebec university.

Recommended Program

Year One
ACC 123, 131; CS 100 or CS 102, ENGL 109
(Requirements of the Applied Studies Program)
FR 195 and FR 196 (or FR 192A/B)
PSYCH 101
Two term courses in a proposed second teaching subject.
Two elective term courses.

Year Two
FR 250
FR 203, 275, 232
One of FR 263, 273, HIST 203X or another French course as advised
PSYCH 212
Two term courses in the second teaching subject.
Two elective term courses.

Year Three
Except in the case of exempted Francophone students, this year is spent at a French-speaking university in France or in Quebec. Students should take the equivalent of: FR 300, 303, 354, 363, plus two half-courses in the second teaching subject or two elective half-courses. The courses chosen should be approved by the Department of French and by other departments in whose discipline courses are taken.

Year Four
FR 400
FR 342, 403, one of FR 409, 410, 421, 422
One further half-course in French
Two half-courses in the second teaching subject
Two elective half-courses
Two term-course tutorials in teaching techniques

French Joint Honours Program
The Department of French recognizes combined honours programs with the following disciplines:

<table>
<thead>
<tr>
<th>Philosophy</th>
<th>Social Development Studies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Political Science</td>
<td>Sociology</td>
</tr>
<tr>
<td>Economics</td>
<td>Spanish</td>
</tr>
</tbody>
</table>

Other combinations must be approved on an individual basis with the departments concerned.

Eligibility for graduation in the Joint Honours French program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 44 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.

2. At least 16 term courses must be in French (in the case of Political Science only 14 are required) of which at least eight must be at the 300- or 400-level. Students must take six term credits in language including FR 300 and FR 400 and six term credits in literature, including at least one each from six of the following areas: Medieval, Renaissance, 17th, 18th, 19th, 20th century French literature or French-Canadian literature, as well as one term credit in linguistics.

Recommended Program

Year One
FR 195 and FR 196
Eight additional term courses

Year Two
FR 300, 303, 354, 363
A minimum of two additional term courses in French literature or linguistics

Year Three
FR 300, 303, 354, 363
A minimum of two additional term courses in French literature or linguistics

Year Four
FR 300, 303, 354, 363
A minimum of two additional term courses in French literature or linguistics

Minor Program in French
A minor program in French will consist of 10 term courses in French Language and/or Literature. Students must complete FR 300 and FR 300A. FR 151, 152, 155, 156, 196, 199, 291 and 292 may not be counted as credits towards a French minor.

Note For All Programs
Students who wish to major or honour in French are strongly urged to take an appropriate first year level French language course in addition to FR 195 and FR 196.
Study in France or Quebec
The Department offers students in an honours program the
desirability of studying for a year at the University of Nantes
in France under a special third-year program. As well,
students may study at a French Language University in
Quebec. More information may be obtained from
Department.

Geography

Admission to the Geography programs in the Faculty of
Arts is gained in second year. Those interested should
take the appropriate Geography courses in first year.

Three-Year General Geography
Eligibility for graduation in the Three-Year General
Geography program includes fulfillment of the following
requirements:
1. Successful completion of a minimum of 30 term
courses including Faculty of Arts Group requirements
with an overall cumulative average of at least 60% and
a cumulative Geography average of at least 65%.
2. A minimum of any 12 term courses in Geography
which may include ENV S 178, 195, 200, 278.

Four-Year General Geography
Eligibility for graduation in the Four-Year General
Geography program includes fulfillment of the following
requirements:
1. Successful completion of a minimum of 40 term
courses including Faculty of Arts Group requirements
with an overall cumulative average of at least 60% and
a cumulative major average of at least 65%.
2. At least 18 term courses in Geography. ENV S 178,
195, 200, 278 can be counted as term courses in
Geography for inclusion in the required 18. These 18
must include at least four Regional Area term courses.
Eligible courses are those listed under the heading
Regional Geography (page 11:20) plus GEOG 206.

Honours Geography
Eligibility for graduation in the Honours Geography
program includes fulfillment of the following requirements:
1. Successful completion of the equivalent of 40 term
courses including Faculty of Arts Group requirements
with an overall cumulative average of at least 60% and
a cumulative major average of at least 75%.
2. At least 18 term courses in Geography. ENV S 178,
195, 200, 278 can be counted as term courses in
Geography for inclusion in the required 18. These 18
must include at least four Regional Area term courses.
Eligible courses are those listed under the heading
Regional Geography (page 11:20) plus GEOG 206.

Required Four-Year Program – General or Honours

Year One
GEOG 101 Introduction to Human Geography
GEOG 102 Introduction to Physical Geography
GEOG 160 Introduction to Cartography and Map Analysis
GEOG 120 The World Region
Six electives which should include some Arts Faculty
Group A requirements

Year Two
GEOG 202A Location of Economic Activities
GEOG 202B The Geography of Economic Development
(Honours only)
ENV S 178 Introduction to Environmental Research or
equivalent basic statistics course (page 9:7)
Two of:
GEOG 204 Soviet Union
GEOG 205 Africa
GEOG 206 The World Region and World Issues
GEOG 221 U.S.A.
GEOG 226 Food, Agriculture and Integrated Rural
Development in the Third World
GEOG 227 Regional Problems of Europe
One of:
ENV S 200 Field Ecology
GEOG 201 Geomorphology and Soils
GEOG 208 Applied Climatology
GEOG 309 Physical Climatology
Electives

Year Three
GEOG 381 The Nature of Geography
GEOG 390 Honours Thesis Proposal (Honours Only)
Electives

Year Four
One of:
GEOG 490B Honours Thesis (Honours Only)
GEOG 491A/B Senior Research Paper (Honours Only)
Electives

Geography Joint Honours
(See page 11:18).

Minor Program in Geography
A total of ten term courses must be completed in
Geography among which may be included ENV S 195 and
ENV S 200.

Notes For All Programs
1. Electives: By the end of second year, one course is
required from English Group One (page 16:58). ENGL
109, 129R, 140R or 150 may be taken in Year One;
ENGL 208 or 210 may be taken in Year Two. Students
are encouraged to take a second-year language
course and other Arts courses related to a regional
specialization or to consider a Minor or Joint Honours
program within the Faculty of Arts. In the four-year
programs, CS 100 is recommended in Year One for
students without computer experience in high school.
2. For some courses, extra fees may be required to defray heavy equipment/travel costs. Statements on extra costs will be found with the course description.

3. Students intending to teach in Secondary Schools are advised to take at least four term courses in Regional Geography and at least four term courses in another teachable subject.

4. Up to three term course equivalents may be taken as Independent Study courses in Geography.

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**German**

The Department of Germanic and Slavic Languages and Literatures offers the following programs in German:

- Three-Year General Program in German
- Honours Program in German
- Honours German (Applied Studies Co-op)
- Joint Honours Program with German
- Minor Program in German

Students entering German programs are normally placed in one of two streams (A or B), depending upon their knowledge of the German language.

**Stream A**

Students with little or no knowledge of German

- First Year: GER 101/102
- Second Year: GER 201/202

**Stream B**

Students with at least Grade 12 standing in German or equivalent

- First Year: GER 121/122 and/or GER 251/252
- Second Year: GER 291/292

**Three-Year General German**

Eligibility for graduation in the General German program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 30 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.

2. At least 12 term courses must be in German.

**Honours German**

Eligibility for graduation in the Honours German program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.

2. At least 20 term courses must be in German.

**Honours German (Applied Studies Co-op)**

A student may combine an Honours German program with Applied Studies Co-op. The requirements in German are identical to the Joint Honours requirements listed below. The Applied Studies requirements are listed on pages 9:11 and 9:12.

**German Joint Honours**

A Joint Honours program with German may be taken in combination with any other discipline in which an Honours program is offered, subject to approval by the departments concerned.

The following Joint Honours programs have been approved with German:

- Anthropology
- Classical Studies
- Drama
- Economics
- English
- French
- Geography
- History
- Music
- Philosophy
- Political Science
- Psychology
- Russian
- Sociology
- Spanish

Eligibility for graduation in the German Joint Honours program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 44 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.

2. At least 16 term courses must be in German.

**Minor Program in German**

Students of all departments may elect German as a Minor field of studies in consultation with the Department of Germanic and Slavic Languages and Literatures. A minor requires the completion of a minimum of ten term courses in German with an overall cumulative average of at least 65% in those courses, of which:

1. not more than four term courses may be chosen from courses at the 100-level, and

2. at least two term courses must be chosen from courses above the 200-level.

**Waterloo in Germany Program**

The Department offers a yearly program of studies at the University of Mannheim on the Rhine. The program is normally open to students entering third-year courses. In exceptional cases second-year students will also be considered. Students of all disciplines may apply, provided they have an adequate knowledge of German. The application deadline for students who wish to begin studies in Mannheim in the Winter Semester (October 15 to February 15) is April 1. The application deadline for those who wish to begin their studies in the Summer Session (April 15 to July 15) is February 1. Applications should be submitted to “Waterloo in Germany”, Department of Germanic and Slavic Languages and Literatures, University of Waterloo, Waterloo, Ontario N2L 3G1.
Notes For All Programs
1. First-year students who wish to major in German are strongly advised to consult the Undergraduate Advisor of the Department.
2. Before graduation all students majoring in German must complete GER 291/292, normally in Year Two.
3. GER 271/272, GER 355, and GER 391/392 are open to all students. However, these courses will normally count toward the Major or Honours requirement for Stream A students only.

Greek
See Classical Studies.

History
The Department of History offers the following programs:

Three-Year General Program
Four-Year General Program
Honours Program
Honours History Applied Studies Co-op Program
History Joint Honours Program
Minor Program

Three-Year General History
Eligibility for graduation in the General History program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 30 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.

2. At least ten term courses must be in History with at least two above the 250-level and no more than two at the 100-level.

Four-Year General History
Eligibility for graduation in the Four-Year General History program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.

2. At least 14 term courses must be in History with at least two at the 300-level, and no more than two at the 100-level.

Honours History
Eligibility for graduation in the Honours History program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.

2. At least 12 term courses and four senior seminars (4.0 course credits) must be in History. At least one Senior Seminar (1.0) must be a research seminar (with a B suffix). No more than two term courses may be at the 100-level. History courses must include:
   a) 250 or 300
   b) One of 260, 261, 262, 263
   c) One of 253, 254, 273, 274
   d) One of 255, 256, 257, 258

3. The 20 term courses in History are usually divided 2-5-5-8 among the four years.
   * 250 should be taken in second year, 300 in third or fourth year of program.

Honours History (Applied Studies Co-op)
A student may combine an Honours History program with Applied Studies Co-op. The requirement in History is ten (10) term courses and four Senior Seminars (4.0 credit weights). The Applied Studies requirements are listed on pages 9:11 and 9:12.

History Joint Honours Programs
Joint Honours programs are currently available between History and the following departments:

Anthropology
Classical Studies
Drama
Economics
English
Fine Arts
French
Geography

German
Greek
History

2. At least 12 term courses and four senior seminars (4.0 course credits) must be in History. At least one Senior Seminar (1.0) must be a research seminar (with a B suffix). No more than two term courses may be at the 100-level. History courses must include:
   a) 250 or 300
   b) One of 260, 261, 262, 263
   c) One of 253, 254, 273, 274
   d) One of 255, 256, 257, 258

3. The 20 term courses in History are usually divided 2-5-5-8 among the four years.
   * 250 should be taken in second year, 300 in third or fourth year of program.

Honours History (Applied Studies Co-op)
A student may combine an Honours History program with Applied Studies Co-op. The requirement in History is ten (10) term courses and four Senior Seminars (4.0 credit weights). The Applied Studies requirements are listed on pages 9:11 and 9:12.

History Joint Honours Programs
Joint Honours programs are currently available between History and the following departments:

Anthropology
Classical Studies
Drama
Economics
English
Fine Arts
French
Geography

Minor Program
To qualify for a Minor in History, students must complete ten term courses in History, with at least two above the 250-level and no more than two at the 100-level. Students from other departments and faculties who are interested in taking a Minor in History should consult with the Department of History Undergraduate Officer. They must maintain a 65% average in History courses.
Italian

Minor Program
Students enrolled in Honours programs in Arts or other faculties may elect a Minor in Italian, which requires the successful completion of at least six term courses in one of the subject fields specified below.

Four additional term courses must be chosen from any of the following courses:
ITAL 101, 102, 191, 192, 251, 252

Note
Those students with OAC Italian or whose competency in the language excludes them from ITAL 101, 102 must substitute ITAL 291, 292 for this requirement.

Latin

See Classical Studies.

Management Studies

See page 15:8 for program description.

Medieval Studies

Students interested in an interdisciplinary approach to university education and to an examination of the Middle Ages may take either a General or an Honours BA in Medieval Studies. Such a degree is designed to provide a general awareness of our cultural heritage. In addition, the program is flexible enough to prepare students for careers in teaching, or for the pursuit of a graduate degree.

The Medieval Studies program is administered jointly by the History Department at St. Jerome’s College (Dr. J.A. Wahl) and by the Department of Classical Studies (Dr. L.L. Neurum). Interested students may call or write either of these advisors for further information.

Three-Year General Medieval Studies
Eligibility for graduation in the General Medieval Studies program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 30 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.

2. At least 14 term courses must be from an approved list of Medieval Studies or related courses, including at least two term courses from each of the four of the eight subject fields specified below.


Honours Medieval Studies
Eligibility for graduation in the Honours Medieval Studies program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.

2. At least 16 term courses must be from an approved list of Medieval Studies or related courses, including at least two term courses from each of five of the eight subject fields specified below.

3. Successful completion of at least ten term courses (not all of which need be medieval in content) in one of the subject fields specified below.

Music

Three-Year General Music
Eligibility for graduation in the General Music program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 30 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.

2. At least 14 term courses in Music, including MUSIC:
   a) 100, 250, 251;
   b) at least three of 253, 254, 353, 354.

3. Participation in at least four terms of Music Ensemble.

In addition, students must demonstrate competence on one instrument (or voice) equal to Grade Ten standing at the Royal Conservatory of Music of Toronto. Normally this is attained through taking Music Studio Courses – MUSIC 266, 267, 366, 367.

Honours Music
Eligibility for graduation in the Honours Music program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements
with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.

2. At least 20 term courses in Music, including MUSIC:
   a) 100, 250, 253, 254, 353, 354, 370, 371, 490A/B;
   b) 466, 467 or two other 300-level courses.

3. Participation in at least six terms of Music Ensemble.

In addition, students must demonstrate competence on one instrument (or voice) equal to Grade Ten standing at the Royal Conservatory of Music of Toronto. Normally this is attained through taking Music Studio Courses – MUSIC 266, 267, 366, 367.

Honours Music (Applied Studies Co-op)
A student may combine an Honours Music program with Applied Studies Co-op. The requirements in Music are identical to the Honours requirements listed above. The Applied Studies requirements are listed on pages 9:11 and 9:12.

Music Joint Honours Program
A Joint Honours program with Music may be taken in combination with any other discipline in which an Honours program is offered, subject to approval by the departments concerned.

The following Joint Honours programs have already been approved with Music:

| Geography | Psychology |
| German | Recreation and Leisure Studies |
| Mathematics | Social Development Studies |
| Philosophy |

Eligibility for graduation in the Music Joint Honours program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 44 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.

2. At least 16 term courses in Music, including MUSIC:
   a) 100;
   b) at least three of 253, 254, 353, 354;
   c) at least three of 250, 251, 370, 371;
   d) 490A/B (unless the senior honours essay is written in the other discipline).

3. Participation in at least six terms of Music Ensemble.

In addition, students must demonstrate competence on one instrument (or voice) equal to Grade Ten standing at the Royal Conservatory of Music of Toronto. Normally this is attained through taking Music Studio Courses – MUSIC 266, 267, 366, 367.

Minor Program
Eligibility for graduation with a Minor in Music includes fulfillment of the following requirements:

1. At least ten term courses in Music, including MUSIC:
   a) 100, 250;
   b) eight additional term courses selected in consultation with the Music Department.

2. Participation in at least two terms of Music Ensemble.

Note For All Programs
Students electing to take Music Studio must arrange for an audition before the Music Faculty. Normally a level of performance equal to Grade Eight standing at the Royal Conservatory of Music of Toronto is expected for admission to Music Studio. Music Studio courses are available only to Music Majors and Minors.

Personnel Studies
See page 15:12 for program description.

Philosophy

Three-Year General Philosophy
Eligibility for graduation in the General Philosophy program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 30 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.

2. At least ten term courses must be in Philosophy, including PHIL:
   a) one of 140, 145, 216, 241, 242, 243, or 440A/B;
   b) 221;
   c) any two of 380 - 387 or 378.

St. Jerome's Philosophy students must meet the basic requirements as listed above, and their PHIL courses must include:

a) one of 200J, 140, 145, 216, 241, 242, 243, or 440A/B;
   b) 218J or 221;
   c) any two of 380 - 387 or 378.

Four-Year General Philosophy
Eligibility for graduation in the Four-Year General Philosophy program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 68%.

2. At least 14 term courses must be in Philosophy, and must include the courses required in the Three-Year General program.

Honours Philosophy
Eligibility for graduation in the Honours Philosophy program includes fulfillment of the following requirements:
1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.

2. At least 18 term courses must be in Philosophy, including PHIL:
   a) one of 216, 241, 242, 243, or 440A/B;
   b) 221, 322, 499A/B;
   c) any four of 380 - 387 or 378.

St. Jerome's Philosophy students must meet the basic requirements as listed above, and their PHIL courses must include:
   a) one of 216, 241, 242, 243, or 440A/B;
   b) 218J or 221;
   c) 322;
   d) any four of 380 - 387 or 378;
   e) 499A and either 499B or 499J.

College students are also expected to take 450J.

Honours Philosophy (Applied Studies Co-op)
A student may combine an Honours Philosophy program with Applied Studies Co-op. The requirements in Philosophy are identical to the Honours requirements listed above except that only 16 term courses in Philosophy are required. The Applied Studies requirements are listed on pages 9:11 and 9:12.

Philosophy Joint Honours Program
A Joint Honours program with Philosophy may be taken in combination with any other discipline in which an Honours program is offered, subject to approval by the Departments concerned. Joint Honours programs have been approved with:
- Economics
- English
- French
- German
- History
- Latin
- Mathematics
- Political Science
- Psychology
- Religious Studies
- Russian
- Social Development
- Studies
- Sociology

Eligibility for graduation in the Joint Honours Philosophy program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 44 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.

2. At least 14 term courses must be in Philosophy, including PHIL:
   a) one or two of 140, 216, 241, 242, 243, or 440A/B (depending on program);
   b) 221, 322;
   c) any four of 380 - 387 or 378;
   d) a Philosophy course which is relevant to the other subject (e.g. Aesthetics for Philosophy and English);
   e) a Senior Honours essay in PHIL 499A/B or in the other subject, if applicable.

Arts
- Philosophy
- Political Science

Students registered at St. Jerome's in a Philosophy Joint Honours program may substitute St. Jerome's Philosophy courses in the same way as for the Philosophy Honours program.

Minor Program in Philosophy
To be eligible for a Minor in Philosophy, students must successfully complete ten term courses in Philosophy that have been approved by the Department.

Political Science
The Department of Political Science offers a series of undergraduate programs designed to meet the needs of students with varying interests. Requirements for each program are restricted to the completion of a specified number of courses in different fields of the discipline before graduation. For these purposes Political Science courses above the 100-level are numbered according to the field within which they fall.

The key to this scheme is the second digit of the course number as follows:

1. methodology
2. normative theory
3. public administration, public law, and public policy
4. local and regional politics
5. comparative politics (more than one country)
6. comparative politics (specific countries)
7. the political process
8. international politics

with the number 9 reserved for special courses which are not regarded as dealing with a particular field of the discipline. PSCI 291 and 292 are non-program courses (see Note page 9:30).

Three-Year General Political Science
Eligibility for graduation in the General Political Science program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 30 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.

2. At least 12 term courses must be in Political Science. Ten of these 12 courses must be above the 100-level, of which at least one term course from each of four different fields of discipline listed above must be taken. At least four term courses must be taken at the 300-level or higher.

Four-Year General Political Science
Eligibility for graduation in the Four-Year General Political Science program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements
with an overall cumulative average of at least 60% and a cumulative major average of at least 70%.

2. At least 18 term courses must be in Political Science. Sixteen of these 18 courses must be above the 100-level, of which at least two term courses from each of four different fields of discipline listed above must be taken. At least four term courses must be taken at the 300-level or higher.

Honours Political Science
Eligibility for graduation in the Honours Political Science program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.

2. At least 20 term courses must be in Political Science. Eighteen of these 20 courses must be above the 100-level, of which at least two term courses from each of four different fields of discipline listed above must be taken. At least four term courses must be taken at the 400-level.

Recommended Program

<table>
<thead>
<tr>
<th>Year One</th>
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</thead>
<tbody>
<tr>
<td>PSCI 101/102</td>
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<tr>
<td>Eight other term courses</td>
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</table>

<table>
<thead>
<tr>
<th>Year Two</th>
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</thead>
<tbody>
<tr>
<td>Six term courses in Political Science (see Note)</td>
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<tr>
<td>Four other term courses</td>
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<tr>
<th>Year Three</th>
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</table>

<table>
<thead>
<tr>
<th>Year Four</th>
</tr>
</thead>
<tbody>
<tr>
<td>Six term courses in Political Science at least four of which must be at the 400-level (see Note)</td>
</tr>
<tr>
<td>Four other term courses</td>
</tr>
</tbody>
</table>

Honours Political Science (Administrative Studies Option)
Eligibility for graduation in the Honours Political Science with an Administrative Studies Option includes fulfillment of the following requirements:

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average (including Administrative Studies courses) of at least 75%.

2. At least 20 term courses must be in Political Science and 14 term courses must be in Administrative Studies. The requirements for an Honours Political Science degree apply for the Honours Political Science with an Administrative Studies Option, plus the following courses must be taken:
   a) ECON 101, 102, PSCI 260A/B, 331:
   b) one of PSCI 332 or 333;
   c) four term courses in Political Science beyond the 100-level which have been designated as Administrative Studies courses by the Department of Political Science;
   d) four term courses not in Political Science, selected from courses which have been designated as Administrative Studies courses by the Department of Political Science.

Other Options
The following study Options are also open to students in Honours Political Science: Women’s Studies, Iberoamerican Studies, Legal Studies, Peace and Conflict Studies, Personnel Studies, Canadian Studies.

Co-operative Program in Honours Political Science
The program leading to the Degree of Bachelor of Arts in Honours Political Science (Co-operative program) is designed for students who intend to enter careers in government, the mass media, business, political parties, or public opinion organizations. Qualified students will ordinarily be admitted to the program after completion of their first three academic terms with a minimum average of 75% in at least two Political Science term courses. The program consists of six further academic terms and a minimum of four paid work terms with participating employers.

The academic requirements of the Co-operative program are identical with those of the Regular Honours program in Political Science. The program is open to students enrolled in either the Regular Honours Political Science program or Honours Political Science (Administrative Studies Option).

The first work term of the Co-operative program occurs after the successful completion of Year Two courses. At the beginning of the fourth year students may have the option of either continuing the pattern of alternating work terms or working for a full year before returning to campus for the last two academic terms.

Interested students should apply to the program in November of Year Two. Ordinarily qualified students are admitted in January of Year Two. The minimum requirement for admission to the program is a 75% average in three Political Science courses. Admissions decisions are made by the Co-op Officer in consultation with the Undergraduate Affairs Committee.

Honours Political Science (Applied Studies Co-op)
A student may combine an Honours Political Science program with Applied Studies Co-op. The requirements for Political Science are a minimum of 16 term courses, with at least 14 beyond the 100-level. There must be at least one term course from each of four different fields of the discipline as defined above. At least 4 term courses must be taken at the 400-level. The Applied Studies requirements are listed on pages 9:11 and 9:12. Students planning to enrol in Honours Political Science (Applied Studies Co-op) should consult the Department’s Co-op Officer.
Political Science Joint Honours Program

Students who wish to combine a study of Political Science with a broad training in a related discipline such as Sociology or History, or in fact in any other discipline in which they are interested, can do so in a Joint Honours program.

Joint Honours programs have been approved between Political Science and:

- Anthropology
- French
- Drama
- Geography
- Economics
- History
- English
- Philosophy
- Environment and Resource Studies
- Psychology
- Sociology

Eligibility for graduation in the Political Science Joint Honours program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 44 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.

2. At least 14 term courses must be in Political Science. Twelve of the 14 courses must be beyond the 100-level, of which there must be at least one term course from each of four different fields of discipline as defined above. Two term courses must be at the 400-level.

Recommended Program

Year One
PSCI 101/102
Two introductory term courses in the other discipline
Six other term courses

Year Two
Four term courses in Political Science (see Note)
Four term courses in the other discipline
Four other term courses

Year Three
Four term courses in Political Science (see Note)
Four term courses in the other discipline
Four other term courses

Year Four
Four term courses in Political Science, at least two of which must be at the 400-level (see Note)
Four term courses in the other discipline
Four other term courses

Minor Program

Any student in an Honours program may qualify for a Minor in Political Science by completing ten term courses in Political Science before graduation with a cumulative average of 65% or better. Courses must be selected to meet the following requirements:

1. at least one term course in each of three different fields of the discipline;

Arts
Political Science
Psychology

2. the equivalent of at least two term courses above the 200-level.

Note For All Programs

No student in a General, Honours, Joint Honours or Minor program in Political Science may use PSCI 291 or 292 to meet program requirements.

Psychology

Three-Year General Psychology

Eligibility for graduation in the General Psychology program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 30 term courses including the Faculty of Arts Group requirements with a cumulative overall average of at least 60%.

2. At least ten term courses must be in Psychology, including PSYCH:
   a) 101;
   b) 200;
   c) at least one of 203, 206, 207, 261, 271;
   d) at least one of 211, 253, 355, 357;
   e) at least one of 212, 213, 333, 334, 335, 338, 339, 341;
   f) five electives in PSYCH.

A minimum cumulative Psychology average of at least 65% is required.

Four-Year General Psychology

The purpose of this program is to enable Honours Psychology students who have completed their third year in Honours Psychology but who are below the 75% average requirement for Honours Psychology, to receive recognition for a fourth year of study.

Students in Honours Psychology who have completed 12 term courses in Psychology, have met Honours requirements a-f, have a cumulative Psychology average of at least 70%, and a cumulative overall average of at least 60%, may transfer to the Four-Year General Psychology program. Students are advised that the Four-Year General program is not equivalent to the Honours Degree-Thesis Program which is normally expected for admission to graduate programs in Psychology. Also, students may not combine this program with: Honours; Minors in other than an Arts discipline; Co-op or Applied Studies; or with certain Options.

Eligibility for graduation in the Four-Year General Psychology program includes the fulfillment of the following requirements:

1. Successful completion of a minimum of 40 term courses including the Faculty of Arts Group requirements with a cumulative overall average of at least 60% and a cumulative Psychology average of at least 70%.
2. At least 16 term courses must be in Psychology, including PSYCH:
   a) 101;
   b) 291, 292, 391 (check overlapping courses on page 9:7 and with the undergraduate secretary);
   c) at least two of 203, 206, 207, 261, 271;
   d) at least two of 211, 253, 355, 357;
   e) at least one of 392, 394, 396, 398;
   f) at least one of 392, 393, 395, 397;
   g) six PSYCH electives.

Students may not use PSYCH 392 to satisfy both e and f.

Honours Psychology (Thesis Program/Coursework Program)

Students interested in Honours or Joint Honours in Psychology will normally be admitted at the beginning of their second year of study based on their academic performance in at least ten term courses in Year One, including PSYCH 101 and preferably one additional term course in Psychology. Application for admission to Honours Psychology is made at the time of pre-registration for Year Two. Normally, only students whose Year One cumulative overall average is at least 70% and whose cumulative Psychology average is at least 75% will be admitted. Owing to resource limitations, however, fulfillment of the minimum entrance average requirements will not guarantee students admission to Honours Psychology, and higher averages may be required for admission. To remain in good standing in Honours Psychology, students must maintain a cumulative overall average of at least 60% and a cumulative Psychology average of at least 75%. Conditional status for one academic term only may be granted to students who fall below these criteria.

Students in Honours Psychology may select either the Thesis Program or the Coursework Program. However, students selecting the Coursework Program are advised that a thesis in Psychology is typically required for admission to graduate studies in Psychology.

Thesis Program

Eligibility for graduation in the Honours Psychology-Thesis Program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 40 term courses including the Faculty of Arts Group requirements with a cumulative overall average of at least 60% and a cumulative Psychology average of at least 75%.

2. At least 18 term courses must be in Psychology, including PSYCH:
   a) 101;
   b) 291, 292, 391; (check overlapping courses on page 9:7 and with the undergraduate secretary)
   c) at least two Natural Science Courses from 203, 206, 207, 261, 271;
   d) at least two Social Science Courses from 211, 253, 355, 357;
   e) one Natural Science Research Course from 392, 394, 396, 398;
   f) one Social Science Research Course from 392, 393, 395, 397;
   g) two Honours Seminars in PSYCH;
   h) three PSYCH electives;
   i) 499A/B/C.

Students may not use PSYCH 392 to satisfy both e and f.

Students should consider prerequisites for third year courses when selecting their second year courses. PSYCH 291, 292, 391, and two research courses should be completed prior to the beginning of the fourth year of the program.

Recommended Program

<table>
<thead>
<tr>
<th>Year One</th>
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<tbody>
<tr>
<td>PSYCH 101 and one PSYCH elective</td>
<td></td>
<td>Eight additional term courses</td>
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<tr>
<th>Year Two</th>
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<tbody>
<tr>
<td>PSYCH 291/292</td>
<td>One Natural Science Course</td>
<td>One Social Science Course</td>
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<tr>
<td>Six additional term courses</td>
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<tr>
<th>Year Three</th>
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<tbody>
<tr>
<td>PSYCH 391</td>
<td>One Natural Science Research Course</td>
<td>One Social Science Research Course</td>
</tr>
<tr>
<td>One Social Science Course</td>
<td>One Honours Seminar In PSYCH</td>
<td>Four additional term courses</td>
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<tr>
<th>Year Four</th>
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<tbody>
<tr>
<td>PSYCH 499A/B/C</td>
<td>One Honours Seminar in PSYCH</td>
<td>Two PSYCH electives</td>
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<tr>
<td>Four additional term courses</td>
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</table>

Coursework Program

Students in the Coursework Program will substitute requirements h) and i) of the Honours Psychology-Thesis Program with four PSYCH electives and two advanced courses in Psychology (those with prerequisites beyond PSYCH 101 that have not been used to fulfill other Psychology requirements).

Honours Psychology (Applied Studies Co-op)

A student may combine an Honours Psychology-Thesis Program or Coursework Program with Applied Studies Co-op.

Students choosing the Thesis Program will substitute requirement h) of the Honours Psychology-Thesis Program with one PSYCH elective. Students choosing the Coursework Program will substitute requirements h) and i) of the Honours Psychology-Thesis Program with two PSYCH electives and two advanced courses in Psychology (those with prerequisites beyond PSYCH 101 that have not been used to fulfill other Psychology requirements).
requirements). Students selecting the Coursework Program are advised that a thesis in Psychology is typically required for admission to graduate studies in Psychology.

Please refer to the Honours Psychology section for application information. Admission will be based on the Psychology and overall averages, with a minimal admission requirement being 75% in Psychology and 70% overall. Admission is limited and will be based on space availability. The Applied Studies requirements are listed on pages 9:11 and 9:12.

Honours Psychology Co-operative Program
Students who have been accepted to the Honours Psychology BA or BSc programs may apply for admission to the Co-op program in November of the second year. Admission is limited and is based on academic standing and space availability. For those accepted, the first work term will be at the end of second year. Students then alternate between academic terms and paid work terms to the end of the degree program.

Generally, students are placed as research or program assistants in such work settings as government and private research organizations, personnel departments, management training programs, correctional institutions, and other educational and/or treatment institutions.

Co-op seminars are conducted during the on-campus terms; these seminars assist students in defining their career objectives, in assessing their interests, strengths, and aptitudes, and in selecting appropriate elective courses and job placements.

Psychology Joint Honours Programs
Joint Honours programs exist with the following departments:

- Anthropology
- Classical Studies
- Dance
- Drama
- Economics
- English
- Environment and Resource Studies
- Fine Arts
- French
- Geography
- German
- History
- Kinesiology
- Mathematics
- Music
- Philosophy
- Political Science
- Recreation
- Religious Studies
- Russian
- Social Development
- Studies
- Sociology
- Spanish

Please refer to the Honours Psychology section for application information.

Students in Joint Honours with Psychology may select either the Thesis Program or the Coursework Program. Students who do not plan to do a Psychology thesis must follow the Psychology Coursework Program requirements. Students are advised that a thesis in Psychology is typically required for admission to graduate studies in Psychology.

Eligibility for graduation in the Joint Honours Psychology program requires successful completion of a minimum of 44 term courses including the Faculty of Arts Group requirements with a cumulative overall average of at least 60% and a minimum cumulative Psychology average of 75%. In addition, if both majors are in the Faculty of Arts, a joint major average of 75% is required. Please consult the department of your second major for their minimum major average requirement.

Students choosing the Thesis Program will substitute requirement h) of the Honours Psychology-Thesis Program with one PSYCH elective. Students choosing the Coursework program will substitute requirements h) and i) of the Honours Psychology-Thesis Program with two PSYCH electives and two advanced courses in Psychology (those with prerequisites beyond PSYCH 101 that have not been used to fulfill other Psychology requirements). If both majors require research methods and/or statistics courses, consult the list of overlapping courses, Item 7, page 9:7, and the undergraduate secretary.

Honours Psychology with a BSc Degree
An Honours Psychology degree program is also available in the Faculty of Science on both a Regular and Co-operative basis. Students may select either the Thesis Program or the Coursework Program. The Psychology requirements are the same as for the Honours Psychology BA students. See Chapter 14.

Minor Program in Psychology
Students in an Honours program in a discipline other than Psychology may choose to minor in Psychology. The Minor requirements are the same as the Psychology requirements for the Three-Year General Psychology program.

Note
See the undergraduate secretary regarding overlapping courses from your major before taking PSYCH 200. Students who have credit in PSYCH 292 or its equivalent (see overlapping content note, Grading Systems, Item 7, page 9:7) may not receive credit for this course. Since ten term courses in Psychology are required, if exempt from PSYCH 200, this course must be replaced by one term course in Psychology.

Religious Studies

Purpose of the Program in Religious Studies:
1. to expose students to the issues and problems involved in, and to the nature of the questions raised by, the study of religious phenomena and ideas;
2. to enable students to approach, in a methodical way, the study of the major religious traditions living today for the purpose of encountering and understanding the life and the expression of religion through the various religions of the world.
3. to introduce them to the distinctive features of one or more religious traditions and to the methods for their systematic study.

The course offerings of the Religious Studies Department fall into the following five areas:
1. World Religions
2. History of the Christian Tradition
3. Biblical Studies
4. Theology - Philosophy - Ethics
5. Religion, Society and Culture.

Areas of Religious Studies to which courses belong are indicated by the area number below the course description.

Three-Year General Religious Studies
Eligibility for graduation in the General Religious Studies program includes fulfillment of the following requirements:
1. Successful completion of a minimum of 30 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.
2. At least ten term courses must be in Religious Studies including RS:
   a) 100A, 200, 230, 231;
   b) one other course from the RS 100A-K sequence;
   c) two term courses at the 300- or 400-level.

Four-Year General Religious Studies
Eligibility for graduation in the Four-Year Religious Studies program includes fulfillment of the following requirements:
1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.
2. At least 14 term courses must be in Religious Studies including RS:
   a) 100A, 200, 230, 231;
   b) one other course from the RS 100A-K sequence;
   c) four term courses at the 300- or 400-level.

Honours Religious Studies
Eligibility for graduation in the Honours Religious Studies program includes fulfillment of the following requirements:
1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.
2. At least 20 term courses must be in Religious Studies including RS:
   a) 100A, 200, 230, 231, 490A/B;
   b) one other course from the RS 100A-K sequence;
   c) one term course from each of the five RS areas;
   d) at least five term courses at or above the 300-level, not including RS 490A/B.

Honours Religious Studies (Applied Studies Co-op)
A student may combine an Honours Religious Studies program with Applied Studies Co-op. The requirements in Religious Studies are identical to the Honours requirements listed above except the overall number of term courses in Religious Studies is 16 rather than 20. The Applied Studies requirements are listed on pages 9:11 and 9:12.

Religious Studies Joint Honours Program
The Religious Studies Department offers Joint Honours programs with the following Departments:

<table>
<thead>
<tr>
<th>Arts</th>
<th>Religious Studies</th>
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</thead>
<tbody>
<tr>
<td>Russian and Slavic Studies</td>
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</table>

Honours Religious Studies (Applied Studies Co-op)
A student may combine an Honours Religious Studies program with Applied Studies Co-op. The requirements in Religious Studies are identical to the Honours requirements listed above except the overall number of term courses in Religious Studies is 16 rather than 20. The Applied Studies requirements are listed on pages 9:11 and 9:12.

Religious Studies Joint Honours Program
The Religious Studies Department offers Joint Honours programs with the following Departments:

<table>
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<th>History</th>
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<tbody>
<tr>
<td>Classical Studies</td>
<td>Music</td>
</tr>
<tr>
<td>English</td>
<td>Philosophy</td>
</tr>
<tr>
<td>Environment and Resource Studies</td>
<td>Psychology</td>
</tr>
<tr>
<td>French</td>
<td>Social Development</td>
</tr>
<tr>
<td>Germanic and Slavic</td>
<td>Studies</td>
</tr>
<tr>
<td>Sociology</td>
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</tbody>
</table>

The requirements in Joint Honours programs are the same as the Honours program, except the overall number of Religious Studies courses is 14 instead of 20. The RS 490 requirements may be waived for students who choose to do their senior honours essay in the other Department. There will be consultation between the Undergraduate Officers of the two Departments.

Minor Program in Religious Studies
Successful completion (65% average) of a minimum of ten term courses from at least four of the five areas of Religious Studies. The sequence of courses is to be determined in consultation with the Undergraduate Advisor of the Department.

Note For All Programs
Students at the University of Waterloo and Wilfrid Laurier University may, with the permission of their advisor, take courses in Religious Studies at either University. For details regarding registration procedures and courses available at Wilfrid Laurier University, consult the Undergraduate Officer, Religious Studies.

Russian and Slavic Studies
The Department of Germanic and Slavic Languages and Literature offers the following programs in Russian and Slavic Studies:

<table>
<thead>
<tr>
<th>Arts</th>
<th>Religious Studies</th>
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<tbody>
<tr>
<td>Russian and Slavic Studies</td>
<td></td>
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</tbody>
</table>

Honours Religious Studies (Applied Studies Co-op)
A student may combine an Honours Religious Studies program with Applied Studies Co-op. The requirements in Religious Studies are identical to the Honours requirements listed above except the overall number of term courses in Religious Studies is 16 rather than 20. The Applied Studies requirements are listed on pages 9:11 and 9:12.

Religious Studies Joint Honours Program
The Religious Studies Department offers Joint Honours programs with the following Departments:

<table>
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<tbody>
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<td>Studies</td>
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<tr>
<td>Sociology</td>
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</table>

The requirements in Joint Honours programs are the same as the Honours program, except the overall number of Religious Studies courses is 14 instead of 20. The RS 490 requirements may be waived for students who choose to do their senior honours essay in the other Department. There will be consultation between the Undergraduate Officers of the two Departments.

Minor Program in Religious Studies
Successful completion (65% average) of a minimum of ten term courses from at least four of the five areas of Religious Studies. The sequence of courses is to be determined in consultation with the Undergraduate Advisor of the Department.

Note For All Programs
Students at the University of Waterloo and Wilfrid Laurier University may, with the permission of their advisor, take courses in Religious Studies at either University. For details regarding registration procedures and courses available at Wilfrid Laurier University, consult the Undergraduate Officer, Religious Studies.

| Russian and Slavic Studies |
|-----------------------------|---------------------------|-----------------------------|
| Three-Year General Program in Russian |
| Honours Program in Russian |
| Honours Program in Slavic Studies |
| Honours Slavic Studies (Applied Studies Co-op) |
| Joint Honours Program with Russian |
| Minor Program in Russian |
| Minor Program in Croatian |
Three-Year General Russian
Eligibility for graduation in the General Russian program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 30 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.

2. At least 12 term courses must be in Russian.

Honours Russian
Eligibility for graduation in the Honours Russian program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 44 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.

2. At least 20 term courses must be in Russian.

Honours Slavic Studies
Eligibility for graduation in the Honours Slavic Studies program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.

2. At least 20 term courses must be in Slavic Studies. Of these 20 term courses, 12 will normally be in Russian and eight in Ukrainian and Polish.

Honours Slavic Studies (Applied Studies Co-op)
A student may combine an Honours Russian program with Applied Studies Co-op. This program includes the following requirements:

1. Successful completion of a minimum of 44 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.

2. At least 16 term courses must be in Slavic Studies, of which ten term courses will normally be in Russian and six in the other Slavic languages.

Russian Joint Honours Program
A Joint Honours program with Russian may be taken in combination with any other discipline in which an Honours program is offered, subject to approval by the departments concerned. Listed below are approved combinations with Russian:

Drama
Economics
English
Environment and Resource Studies
French
Geography
German
History
Mathematics
Philosophy
Political Science
Psychology
Sociology
Spanish

Eligibility for graduation in the Russian Joint Honours program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 44 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75% in each of the two Honours disciplines.

2. At least 16 term courses must be in Russian.

Minor Program in Russian
Students of all departments may elect Russian as a Minor field of studies in consultation with the Department of Germanic and Slavic Languages and Literatures. A Minor requires the completion of a minimum of ten term courses in Russian with an overall cumulative average of at least 65% in those courses, of which:

1. not more than four term courses may be chosen from courses at the 100-level, and

2. at least two term courses must be chosen from courses above the 200-level.

Russian Workshop in the USSR
For details see Chapter 16, page 16:81.

Minor Program in Croatian
The Department of Germanic and Slavic Languages and Literature offers a Minor in Croatian which requires the completion of a minimum of ten term courses in Croatian with an overall average of at least 65%.

Social Development Studies
Social Development Studies, administered by Renison College, is an integrated multidisciplinary program providing a liberal education with concentration in certain pure and applied social sciences. The inter-related courses of this Major are used to help the student develop an appreciation of the interdependence of the social sciences and a facility in applying material and perspectives from one discipline to questions in other areas of study. The College offers its own courses for the Major in Interdisciplinary Social Science, Psychology, Social Work and Sociology. Students select their remaining courses from any of the colleges or departments of the University according to their particular needs and interests.

In the program, particular attention is given to the development of human personality in the context of the major social institutions and our cultural traditions and to the study of the development of certain contemporary social problems. Courses in Social Work provide an opportunity to study various types of social intervention. The College assists students to find places as volunteers in local agencies. Through this volunteer work students are given an opportunity to increase the experience which they can bring to their studies and to test and apply their theoretical understanding in practical settings. In the case
of those following the Diploma in Social Work, a program
coor-ordinator assists the students and the agencies to fulfill
placement expectations.

The Social Development Studies program stands as a
sound liberal and general education. It provides an
excellent background for further study in Social Work,
Education, Theology, Law or Journalism, and for work in
various helping professions, communications, and
community and international service organizations.

Major Courses
Listed below are courses from the four subject areas which
combine in the Social Development Studies Major.

<table>
<thead>
<tr>
<th>Interdisciplinary Social Science</th>
<th>Social Work</th>
<th>Sociology</th>
<th>Psychology</th>
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<tr>
<td>ISS 131R</td>
<td>SOCWK 120R</td>
<td>SOC 120R</td>
<td>PSYCH 120R</td>
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<td>SOCWK 320R</td>
<td>SOC 327R</td>
<td>PSYCH 322R</td>
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<td>350 (A-L)</td>
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<td>322R</td>
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<td>499A/B</td>
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Three-Year General Social Development Studies
Eligibility for graduation in the Three-Year General Social
Development Studies program includes completion of the
following requirements:

1. A minimum of 30 term courses, including Faculty of
   Arts Group requirements, with an overall cumulative
   average of at least 60% and a cumulative Major
   average of at least 65%.

2. At least 14 term courses from the Major. These courses
must be distributed over the four subject areas of the
program using a maximum of six term courses from a
single subject area. (Additional Social Development
Studies courses may be from any of the subject areas.)

Recommended Program, including required courses

**Year One**

- ISS 150R, PSYCH 120R, SOCWK 120R (Fall)
- ISS 131R, PSYCH 121R, SOC 120R (Winter)
- Four additional term courses

Four-Year General Social Development Studies
Eligibility for graduation in the Four-Year General Social
Development Studies program includes completion of the
following requirements:

1. A minimum of 40 term courses, including the Faculty of
   Arts Group requirements, with an overall cumulative
   average of at least 60% and a cumulative Major
   average of at least 65%.

2. Two options are available for completing the Major
   requirements:
   a) The completion of at least 18 term courses from the
      Major (i.e. four term courses in addition to those
      required for the Three-Year General program),
   b) The completion of the 14 term courses required for
      the Three-Year General program plus four term
      courses, selected with College approval, which
      thematically link Social Development studies to
      other disciplines.

Honours Social Development Studies
Eligibility for graduation in the Honours Social
Development Studies program includes completion of the
following requirements:

1. A minimum of 42 term courses including Faculty of Arts
   Group requirements with an overall cumulative average
   of at least 60% and a cumulative average of at least
   75% in the Major.

2. At least 18 term courses from the Major.

3. Eight term courses, selected in consultation with
   Renison's Undergraduate Officer, to explore in depth a
   topic related to the students' interests (i.e. theme area).

Recommended Program, including required courses:

**Year One**

- ISS 150R, PSYCH 120R, SOCWK 120R (Fall)
- ISS 131R, PSYCH 121R, SOC 120R (Winter)
- Four additional term courses

**Year Two**

- ISS 250R, 251R
- Two other term courses from the Major
- Six additional term courses

**Year Three**

- Four term courses from the Major
- Six additional term courses
Social Development Studies Joint Honours Program

Joint Honours programs are currently available with:

- English
- Psychology
- French
- Recreation
- Music
- Religious Studies
- Philosophy
- Sociology

Eligibility for graduation in the Social Development Studies Joint Honours program typically includes completion of the following requirements (variations may occur depending on the other discipline being considered):

1. A minimum of 44 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative Major average of at least 75%.
2. At least 14 term courses from Social Development Studies including:
   a) four term courses from ISS 131R, ISS 150R, PSYCH 120R, SOC 120R, SOCWK 120R;
   b) ISS 250R, 251R (Methodology);
   c) ISS 320R, plus five term courses beyond the first-year level;
   d) ISS 499A/B (Senior Honours Essay).

The equivalent courses to ISS 250R/251R and ISS 499A/B may be taken in the other discipline, subject to approval by both departments. If such replacement occurs, sufficient Social Development Studies electives must be taken to meet the 14 term course minimum requirement.

3. At least six term courses relating to a chosen theme area (see number 3 under Honours program).

Course selection for a Joint Honours program with Social Development Studies should only be made after consultation with Renison's Undergraduate Officer.

The Social Work Stream

Within the Social Development Studies program, a Social Work stream has been developed to meet the particular needs of students who plan to pursue graduate studies in Social work or to follow vocations in Social Work or the related helping professions. The courses in this stream meet the Faculty of Arts requirements for the BA and the College's requirements for the Major (see details in Renison College calendar). Course selection should be made in consultation with Renison's Undergraduate Officer.

Diploma in Social Work

At the end of Year One, students following the Social Work Stream within the Social Development Studies program may apply and be considered for admission to the Diploma in Social Work. During the two years they follow the program, Diploma students are required to complete 400 hours of supervised and evaluated field placement and the following courses: SOCWK 001, 350D, 350E, and ISS 399R (independent study during which students produce a major paper synthesizing their field work with their studies).

An additional fee of $100.00 is assessed for each of the two phases of the Diploma program to cover costs of placement not provided for in the operating grants received from the Government.

Minor Program

A Minor in Social Development Studies requires the completion of ten term courses from the Major with an overall cumulative average of at least 65%. Courses may be selected to fill the needs of the individual student, but course selection should only be made after consultation with the Undergraduate Officer for Social Development Studies. The following requirements apply to the Minor in Social Development Studies:

1. ISS 131R, ISS 150R, SOCWK 120R;
2. seven term courses beyond the first-year level including at least two term courses in each of two different disciplines.

Of the ten term courses required for the Minor, no more than six may be taken in any one discipline.

CERTIFICATE PROGRAMS

Renison College offers three Certificate programs. Courses which make up these programs can also be used for a degree. Certificates will be issued by the College to those students who satisfy program requirements and notify the College upon completion.

The Certificate of Study in General Social Work

Eligibility for this certificate includes the successful completion of ten term courses, with an overall cumulative average of at least 65%, as follows:

1. PSYCH 120R; PSYCH 121R or ISS 150R; SOC 120R; SOCWK 120R, 220R, 221 R, 222R,
2. At least one but not more than two of: SOCWK 320R, 321 R, 322R;

The Certificate of Study in Social Work (Child Abuse)

Eligibility for this Certificate includes the successful completion of ten term courses, with an overall cumulative average of at least 65%, as follows:
SOCWK 120R or SOCWK 350C; ISS 220R; SOCWK 220R, 221R, 320R, 321R, 355H; PSYCH 211; PHIL 220 or ISS 350F; SOCWK 357R or SOCWK 350B.

Students who have completed the requirements for the Certificate of Study in General Social Work will be eligible for the Certificate of Study in Social Work (Child Abuse) with the successful completion of a further five term courses with a cumulative average of at least 65% as follows:

ISS 220R or SOCWK 350C; SOCWK 355R, PSYCH 211, PHIL 220 or ISS 350F, SOCWK 357R or SOCWK 350B.

Note
For this certificate, SOCWK 390A/B may be substituted for any two of: PSYCH 211, PHIL 220, ISS 220 or 350F.

The Certificate of Associate in Arts
Eligibility for this Certificate includes completion of the requirements for one of the Social Work certificate programs as well as an additional five term courses, three of which must meet Group A requirements of the Faculty of Arts, with a cumulative overall average of at least 65%.

Notes For All Programs
1. For students in Minor programs who do not have at least one term course in statistics and one term course in research, and especially those considering graduate studies in Social Work, ISS 25017 and ISS 251R are strongly recommended.
2. For further information regarding any of the programs, consult the Registrar, Renison College, Waterloo, Ontario N2L 3G4.

Sociology

Three-Year General Sociology
Eligibility for graduation in the General Sociology (three-year degree) program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 30 term courses including Faculty of Arts Group requirements with an overall cumulative average of 60% and a cumulative major average of at least 65%.
2. At least ten term courses must be in Sociology, including SOC:
   a) 101 (introductory course), 281 or 321 (sociological methods course);
   b) one of 305, 405, 406 (sociological theory); Students are strongly encouraged to select SOC 280, although this is not required.

Four-Year General Sociology
The requirements for the Four-Year General degree are parallel to those for the Honours degree (see below) with two exceptions. 499A/B is not required, and the minimum required average for all sociology courses is 68%.

Honours Sociology
Eligibility for graduation in the Honours Sociology program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.
2. At least 19 term courses must be in Sociology, including SOC 101, 280, 321, 322, 405, 406, 499A/B.

Recommended Program

Year One
SOC 101
One other term course in Sociology
Eight term course equivalent electives

Year Two
SOC 280
Four term courses in Sociology
Five term course equivalent electives

Year Three
SOC 321, 322
Four term courses in Sociology
Four term course equivalent electives

Year Four
SOC 405/406
SOC 499A/B
Two term courses in Sociology
Four term course equivalent electives

Honours Sociology Co-operative Program
The Department of Sociology is a participating Department in the Co-operative program in the Behavioural Sciences. This is an Honours program into which students may be admitted at the start of the winter term of their second year. Students interested in applying for admission to this program should consult with the Department's Co-op advisor sometime in their first year so that they may select their courses to maximum advantage.

Honours Sociology (Applied Studies Co-op)
A student may combine an Honours Sociology program with Applied Studies Co-op. The requirements in Sociology are identical to the Honours requirements listed above except only 16 term courses in Sociology are required. The Applied Studies requirements are listed on pages 9:11 and 9:12.

Sociology Joint Honours Programs
Sociology has Joint Honours programs with the following:

Anthropology  Philosophy
Economics  Political Science
English  Psychology
Fine Arts  Recreation and Leisure
French  Studies
Geography  Social Development
History  Studies
Mathematics  Spanish
Eligibility for graduation in the Joint Honours Sociology program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 44 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average in each major of at least 75%.

2. At least 15 term courses must be in Sociology, and these courses are usually distributed as follows:
   a) A term course in Introductory Sociology (101);
   b) A term course in Statistics (280);
   c) Two term courses in research methods (321/322);
   d) Two term courses in sociological theory (405, 406);
   e) The equivalent of seven term courses of electives in Sociology plus 499A/B or the equivalent of nine term courses of electives in Sociology plus the equivalent of 499A/B in the related department.

Note For Joint Honours Program
In the Joint Honours program with French, SOC 280 may be replaced by an elective in Sociology.

Minor Program
Students electing a Minor program in Sociology must complete ten term courses in Sociology with a minimum 65% average for all Sociology courses.

The required courses in Sociology for the General program in Sociology are also required of students choosing the Minor program.

Spanish
(Offered jointly with Wilfrid Laurier University)

Three-Year General Spanish
Eligibility for graduation in the General Spanish program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 30 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 65%.

2. At least 12 term courses must be in Spanish of which:
   a) six term courses are language;
   b) two term courses are Survey of Spanish Literature.

Four-Year General Spanish
Eligibility for graduation in the Four-Year General Spanish program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 70%.

2. At least 12 term courses must be in Spanish of which:
   a) six term courses are language above the 100-level;
   b) two term courses are Survey of Spanish Literature;
   c) two term courses are Survey of Latin American Literature;
   d) one term course in Golden Age.

Honours Spanish
Eligibility for graduation in the Honours Spanish program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.

2. At least 20 term courses must be in Spanish, and ten of these 20 term courses must be in courses as outlined above under the Four-Year General program.

Recommended Program

Year One
SPAN 201A/B (Students with little or no Spanish will take SPAN 101/102 in the first year and SPAN 201A/B in the second year).
Eight additional term courses.

Year Two
A minimum of six term courses in Spanish, including SPAN 251A/B, (or 201A/B) and 205/206.
Four additional term courses.

Year Three
A minimum of six term courses in Spanish, including SPAN 351A/B, (or 251A/B), 227/228 and 326 or 327.
Four additional term courses.

Year Four
A minimum of six term courses in Spanish.
Four additional term courses.

Honours Spanish (Applied Studies Co-op)
A student may combine an Honours Spanish program with Applied Studies Co-op. The requirements in Spanish are identical to the Joint Honours requirements listed below. The Applied Studies requirements are listed on pages 9.11 and 9.12.

Spanish Joint Honours Program
The Department of Spanish recognizes combined Honours programs in Spanish and the following:

Classical Studies  History
English  Latin
French  Sociology
German  Psychology

Other combinations must be approved on an individual basis with the departments concerned.
Eligibility for graduation in the Joint Honours Spanish program includes fulfillment of the following requirements:

1. Successful completion of a minimum of 44 term courses including Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative major average of at least 75%.

2. At least 16 term courses must be in Spanish, and ten of these 16 term courses must be in courses as outlined above under the Four-Year General program.

Recommended Program

Year One
SPAN 201A/B (Students with little or no Spanish will take SPAN 101/102 in the first year and SPAN 201A/B in the second year.)
Eight additional term courses.

Year Two
A minimum of four term courses in Spanish, including SPAN 251A/B, (or 201A/B), and 205/206.
Six additional term courses.

Year Three
A minimum of six term courses in Spanish, including SPAN 351A/B, (or 251A/B), 227/228 and 326 or 327.
Six additional term courses.

Year Four
A minimum of four term courses in Spanish.
Six additional term courses.

Minor Program in Spanish
Students in an Honours program interested in Spanish as a complement to the major field of study will be expected to complete ten term courses in Spanish. Please consult the Undergraduate Officer in Spanish for Minor in Spanish.

Notes For All Programs
1. By agreement, students at the University of Waterloo and Wilfrid Laurier University can be expected to take courses in Spanish at either university. While most language courses are taught concurrently every year at both universities, most other courses are taught either at one university or the other, and a few courses may rotate from year to year.

2. With the permission of the Department, students may spend the third year enrolled in an acceptable university in Spain or Latin America.

3. Students in Years Three and Four must have the permission of the home department to enrol in Spanish courses at the 100- or 200-level.
Minor Program in Speech Communication

Students in an Honours Program interested in Speech Communication as a complement to their major field of study will be expected to complete ten term courses: five in Speech Communication and five in the approved Cognate courses concerned with communication from other disciplines.

Required core Speech Communication courses:
DRAMA 102, 223, 224

Two of four optional Speech Communication courses:
DRAMA 225, 323, 324, 326

Plus five approved Cognate courses.

Option in Speech Communication

Students in any degree program interested in Speech Communication as a complement to their studies will be expected to complete eight term courses: four in Speech Communication and four in the approved Cognate courses concerned with communication from other disciplines.

Required core Speech Communication courses:
DRAMA 223, 224

Two of four optional Speech Communication courses:

Plus four approved Cognate courses.

Notes For Minor and Option Programs

1. Students can double count two of the Cognate courses toward their major field of study and the Minor or Option.

2. Students enrol in Cognate courses concerned with communication from other disciplines, either from the following list of recommended courses or in consultation with the Co-ordinator of Speech Communication.

Course Requirements

Limited enrollment in all Speech Communication Courses; early registration advised.

Core Speech Communication Courses

DRAMA 102 Introduction to Acting (Minor only)
DRAMA 223 Public Speaking (must attend first class)
DRAMA 224 Interpersonal Communication

Optional Speech Communication Courses

DRAMA 225 Interviewing
DRAMA 323 Speech Writing
DRAMA 324 Small Group Communication
DRAMA 326 Voice Technique 1

Approved Cognate Courses

ACC 432 Communicating Accounting Information for Decision Makers
ACC 443 Creative Thinking, Problem Solving and Decision Making for Accountants
CS 492 Social Implications of Computers
DRAMA 221 Intermediate Acting 1
DRAMA 222 Intermediate Acting 2

Advanced Acting 1
Advanced Acting 2
Introduction to Linguistics
Rhetoric: Principles and Practice 1
Rhetoric: Principles and Practice 2
Contemporary Rhetorical Theory
Approaches to Style
Advanced Spoken French 2
Advanced Spoken French 3
Advanced Spoken French 4
Organizational Behaviour 1
Organizational Behaviour 2
Basic Personnel Administration
Concepts and issues in Personnel Administration
Critical Thinking
Intentional Logic
Rational Behaviour and Decision-Making
Conflict, Contract and Choice
Critical Thinking 2
The Small Group in the Planning Process
Public Sector Management
Public Opinion and Propaganda
Social Psychology
Interpersonal Relations
Theories of Individual Counselling
Personality and Behaviour Change
Organizational Psychology
Personnel Psychology
Theories of Group Counselling
Group and Individual Counselling
Language, Society and Identity
Social Psychology and Everyday Life
Interpersonal Communication
Mass Communication
Seminar in Group Dynamics
Faculty of Engineering

The "Midnight Sun", UW's solar entry in SUNRAYCE, USA. It was one of two Canadian entries in the Florida to Michigan race.
The Degrees of Bachelor of Applied Science (BASc) is awarded by the University in the following undergraduate programs:

- Chemical Engineering
- Civil Engineering
- Computer Engineering
- Electrical Engineering
- Geological Engineering

During particular terms, a form must be completed. Normally the request should be made within the first two weeks of the term preceding the switch point. In addition, the student's academic performance must be "in good standing". It should be noted that the student's academic program may be restricted due to lack of choice of core or elective subjects permitting considerable diversity in individual programs of study. An important part of the curriculum is a series of electives in the Humanities and Social Sciences.

A more detailed explanation of the Co-operative program is given in Chapter 5, as well as specific requirements as noted under the examinations and promotions section of this chapter.

Change of Term Sequence
Term sequence changes are considered by the Faculty in which the student is enrolled. Application, in the form of a letter from the student (supported by an employer and/or a Co-ordinator) must be made to the appropriate Assistant Registrar. For some Faculties, an appropriate application form must be completed. Normally the request should be made within the first two weeks of the term preceding the switch point. In addition, the student's academic performance must be "in good standing". It should be noted that the student's academic program may be restricted due to lack of choice of core or elective subjects during particular terms.

Degrees
The Degree of Bachelor of Applied Science (BASc) is awarded by the University in the following undergraduate programs:

- Chemical Engineering
- Civil Engineering
- Computer Engineering
- Electrical Engineering
- Geological Engineering

Admission

All Year One students enrol in September. These students spend the Fall term together at the University, after which they are divided into two groups. They also complete the last term of the program and graduate together. Both groups have the same total time on campus and in industry, one group having two academic terms in sequence at the start of the program and the other having two academic terms in sequence at the end of the program. Precise dates for the beginning and end of the various terms are shown in the Academic Calendar on pages 8 to 11.

Systems Design Engineering students start in September with four months of school (Stream 4) before going out on the first work term in January. Computer Engineering and Geological Engineering students start in September with eight months of school (Stream 8) before their first work term which starts in May. Chemical, Civil, Electrical and Mechanical Engineering students may be either Stream 4 or Stream 8.

The admission categories, requirements and procedures for all programs are outlined in Chapter 2 of this Calendar. The following emphasize some of the admission requirements which relate specifically to the Faculty of Engineering.

Applicants from Ontario Secondary Schools
Applicants must present six credits, five of which are required courses. See the Admission Requirements chart in Chapter 2 for information about admission requirements. Applicants with high overall standing who are missing any of the required courses must contact the Director of Admissions for Engineering no later than December (for the next September admission). Applicants will be evaluated and advised on possible courses of action required to meet the specific requirements.

Admission as an Adult Student
Applicants must obtain standing in Ontario Academic Course Mathematics and Science or their equivalent. The University has developed special pre-university physics and chemistry courses which can be taken by correspondence and which are recommended for Adult Students. To discuss admissibility and appropriate qualifying studies, applicants are advised to contact the Director of Admissions for the Faculty of Engineering.
Admission to Advanced Standing
Due to the co-operative nature of the Engineering program, no student will be admitted above Year Three, term A level. Any student thus admitted will be required to register in the January term and to complete satisfactorily the final four academic terms and the final three University of Waterloo work terms and work reports. The level of advanced admission is determined by an examination of the applicant's academic and work experience.

Credit for previous work experience can be applied only to those work terms preceding the level of admission and cannot exceed three work terms.

Examinations and Promotions

(These regulations apply to students who will graduate in the class of 1990 or thereafter.)

The Faculty constitutes the examining body for all examinations and is responsible for all decisions on grades, promotions, failures, deferred examinations, appeals, and recommendations for the granting of degrees. Students are examined and grades are set for individual courses on the completion of work for those courses. Upon examination of the student's performance at the end of each term, the Examinations and Promotions Committee assigns an academic decision. The possible decisions and their effect on the student's progress in the program are as follows:

1. Promoted — proceed to next term.
2. Proceed on Probation — proceed to next term, but subsequent progress is contingent upon clearing pending conditions. Normally, Proceed on Probation will not be awarded for two terms in succession.
3. Conditionally Promoted — student must clear failed courses before the beginning of the second succeeding academic term.
4. Academic Decision Deferred — may not proceed until conditions cleared.
5. Required to Repeat Term — must stay out two terms before repeating.
6. Required to Withdraw from Engineering — readmission possible only through application to Admissions Committee after at least three terms out and with new evidence of ability to succeed. (Except in 1A term — see rule #7, page 10:4).
7. Recommended for BASc Degree at Spring/Fall Convocation — program successfully completed.
8. Promoted (Aegrotat) — student has adequate understanding of the material, but due to illness or other extenuating circumstances, normal evaluation was not possible; proceed to next term.

At the end of each term, the examining Faculty members submit grades for that term's courses. Each department then reviews the performance of students registered in that department and makes recommendations to the Examinations and Promotions Committee. The Examinations and Promotions Committee then considers the evidence on which the departments have made their recommendations and assigns the official academic decision. An appeal or petition relating to an assigned academic decision, grade, or other evaluation, or relating to other decisions based on University policies, may be made by following the procedures outlined in the Appeals and Petitions section of these regulations. All academic decisions and grades are reported to the student through the Registrar's Office. All recommendations to award degrees must be approved by the Senate of the University.

The rules which are applied when the student's performance is assessed are as follows:

1. To be Promoted in the program, a student must have an average of 60% or better, with no course below 50%. Students who fail to meet this requirement will be Conditionally Promoted, Required to Repeat the Term, Required to Withdraw from Engineering, allowed to Proceed on Probation, granted Aegrotat Standing, or have the Academic Decision Deferred, according to the conditions identified below.

2. To remain in the program, a student must have a term average of 50% or better. Students who fail to meet this requirement will be Required to Withdraw from Engineering. Except in 1A, a student receiving an average below 50% who has never before had an average below 80% will have the Academic Decision Deferred for two months to allow the student an opportunity to bring forward evidence of extenuating circumstances which affected the term performance.

3. A student who achieves a term average of 60% or better, but who has one or two courses below 50%, will be Conditionally Promoted. The condition may be satisfied, and the promotion confirmed, in one of the following ways, as determined by the student's Department of registration.
   a) A Department may require a student to repeat a course in which a grade of less than 50% was received, and to obtain a grade of at least 50% in such a course. The grade received upon repetition would not affect the student's original term average.
   b) If a subject is failed with a grade of at least 39%, the failure may be considered cleared if the student's performance in the immediate next academic term results in an average of at least 60% with no course failures. A credit will then be entered on the student's record for that subject, although the original failing grade does not change. If the following academic term does not clear the failure in this way, then the student will be required to repeat that term.
   c) If the failed subject has a grade of 39% or more, a department may require the failure to be cleared by supplementary work. Satisfactory completion of the supplementary work will result in a "Credit" for the failed course, and there is a non-refundable fee for such supplementary work.
d) For a failed subject with a grade of 39% or more, the department may require a formal re-
examination of the subject by written examination held at a time specified by the department. Such re-
examination will not affect the student's term average. To clear the failure, a grade of at least 50% must be obtained on the supplemental examination within eight months from the original failure, and will be recorded on the Grade Report. There is a non-refundable re-examination fee for each such supplemental examination.
e) A student who fails a subject with a grade of 38% or less, may, with the permission of the department of registration, replace that subject during the first available academic term, as a condition of promotion. This is done by obtaining at least 50% in an extra course as assigned by the Department. The extra course will not be included in the student's term average.
f) A student who does not clear a failed course according to (a), (b), (c), (d) or (e) on the first attempt or who does not have departmental permission as required under (e), will be required to register for a non-degree term. The subjects and standings required in the non-degree term are to be specified by the department in advance with the objective of correcting deficiencies in preparation and preparing the student to proceed in the program with reduced chances of further difficulties.

A student who fails to satisfy these conditions may not proceed further in the program, and no student may obtain the BASc degree without satisfying these conditions for all courses beyond 1A in which a grade of at least 50% has not been achieved.

4. A student who achieves a term average of 50% or better, but less than 60%, or a student who achieves a term average of 60% or better, but who has more than two courses below 50%, will be Required to Repeat the Term.

5. The term No Penalty may be appended to the decision to repeat a term. In this case, the requirement to stay out for two terms before repeating the term is waived and the term is not counted as a repeat term with regard to the number of times a term can be repeated or in the calculation of the total number of terms of full-time study in the program. This condition is normally applied as a result of extenuating circumstances which affected the student's performance in the failed term.

6. Students repeating a term must achieve an average of 60% or better with no course below 50% or they will be Required to Withdraw from Engineering. Only two repeated terms are permitted in total, with no single term being repeated more than once; otherwise the student will be Required to Withdraw from Engineering. While repeating a term, a student may be excused from repeating individual courses in which a grade of 70% or better has been achieved. If this is permitted, however, other appropriate courses, at the Department's discretion must be taken, such that a full course load is maintained. In all cases, the program must be completed in no more than ten terms of full-time study.

7. In the 1A term only, students are promoted if they achieve an average of 60%, with no more than two courses having a grade of less than 50%. Students may Proceed on Probation if their term average is 50% or better (but less than 60%) with no more than two courses below 50%. Students who do not satisfy these requirements and are required to withdraw, may request a Qualifying Program for Readmission, and may apply for readmission without waiting the three terms normally required.

8. A student may withdraw voluntarily from the program at any time prior to 4 weeks before the commencement of the final examination period in the term by giving written notification of withdrawal. IN 1A ONLY, a student may withdraw voluntarily from the program at any time prior to the commencement of the final examination period by giving written notification of withdrawal. Should a student who has voluntarily withdrawn wish to re-enter the program, he/she may re-apply to the program directly through application to the Admissions Committee of the Faculty.

9. A student may be Required to Withdraw from Engineering at any time if, in the opinion of the Faculty, the student is unlikely to benefit from further participation in the program or if the student leaves the program without notification and fails to write examinations.

10. Courses taken by students during work terms will not be included in the average for any term. The grades for courses taken at the University of Waterloo or at another university on Letter of Permission, however, will be reported on the student's transcript. Normally, such courses are considered as enrichment to the student's program; when the material of such a course is deemed to cover a subsequent course in the program, the student may receive permission to replace the subsequent course by a free elective (technical or non-technical) approved by the Department Associate Chair. Courses taken during work terms may not be used to reduce the number of courses taken in any subsequent term. Normally, all students will be expected to register in the minimum number of courses specified in the Calendar for each term of the program.

11. Grades for courses that are in addition to the degree requirements will not be included in the term average but will be reported on the student's transcript. The Faculty of Engineering does not permit students to register in any of its courses on an audit basis.

12. Students who have successfully met all of the requirements of the program and have been recommended for the BASc degree will have First,
Second, or Third Class Honours standing designated according to the cumulative 3A-4B average as follows:

First Class Honours: Average 80-100%
Second Class Honours: Average 70-79%
Third Class Honours: Average 60-69%

13. Individual departments may designate additional minimum grade requirements in certain courses. Also, there are individual department rules regarding the grading and averaging of Complementary Studies elective courses.

14. All courses in the Faculty are assigned a numerical grade (between 0 and 100) by the examiners. The following exceptions are permitted:

AEG — Aegrotat. The student was ill according to medical evidence but has satisfactory understanding of the course.
CR — Credit granted. Performance was satisfactory.
NCR — No credit granted. Performance was unsatisfactory.
INC — Incomplete. The course work is incomplete and the student has permission to extend the work beyond the term. If the work is not completed within six months from the end of the term, a grade will be submitted based on the available information.
DNW — Did not write. The student did not withdraw from the course and was not eligible for an Incomplete grade. The student did not complete a sufficient proportion of the assignments, tests, and examinations for an evaluation to be made.

In cases where students take courses in a Faculty where letter grades are assigned, the letter grades will be converted for the purposes of reporting and averaging according to the following table:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>A+</td>
<td>95</td>
</tr>
<tr>
<td>A</td>
<td>89</td>
</tr>
<tr>
<td>A-</td>
<td>83</td>
</tr>
<tr>
<td>B+</td>
<td>78</td>
</tr>
<tr>
<td>B</td>
<td>75</td>
</tr>
<tr>
<td>B-</td>
<td>72</td>
</tr>
<tr>
<td>C+</td>
<td>68</td>
</tr>
<tr>
<td>C</td>
<td>65</td>
</tr>
<tr>
<td>C-</td>
<td>62</td>
</tr>
<tr>
<td>D+</td>
<td>58</td>
</tr>
<tr>
<td>D</td>
<td>55</td>
</tr>
<tr>
<td>D-</td>
<td>52</td>
</tr>
<tr>
<td>F+</td>
<td>46</td>
</tr>
<tr>
<td>F</td>
<td>38</td>
</tr>
<tr>
<td>F-</td>
<td>32</td>
</tr>
</tbody>
</table>

15. Changes to the set of courses which a student is taking in a particular term may be permitted at the discretion of the student's department. Such changes must normally be arranged and approved before the end of the normal "Drop/Add" period, which is a period of two weeks at the beginning of each term. After this period, only exceptional cases will be considered.

16. Students must demonstrate consistent satisfactory performance during their work term employment. They must also submit the required number of satisfactory work term reports (see booklet entitled Regulations and Procedures for Co-operative Programs).

Appeals and Petitions
Two distinct situations in which a student may wish to approach the Faculty with a request are the following: an appeal of an academic grade or decision, and a petition for special consideration. In the case of an appeal, the student is disputing the grade or decision for reasons which must be provided; in the case of a petition, the student agrees that the rules have been applied fairly and is not disputing grades but, rather, is requesting special consideration because of extenuating circumstances. The procedure by which such requests will be considered is described in the following paragraphs. The University policy on student appeals and associated procedures is summarized on page 1:10 of this Calendar and copies of the complete Student Appeal Policy and Procedures document are available from the Associate Deans, the Registrar's Office, the University Graduate Office, the University Secretariat, and the Ombudsperson.

Petitions
Petitions apply in those instances where a student acknowledges that the rules and regulations of the University have been applied fairly but is requesting that an exception to the regulations be made because of special circumstances. A petition is launched by submitting a Petition for Special Consideration (Form D) to the Assistant Registrar for Engineering, Registrar's Office, University of Waterloo. Reasons for such requests for special treatment as well as supporting documentation, including medical certificates and similar documents, must be provided with the petition. If a successful petition would reverse an academic decision, the petition must be received prior to four weeks after the date of issue of the marks for the corresponding term in order to facilitate entry into the immediately following term if so desired by the student. Petitions which are launched later than six months after the end of the term for which the decision would be affected will not be considered.

All petitions are considered by the Faculty Examinations and Promotions Committee. This committee will also acquire and consider the recommendation made by the student's home department, and by the Department of Co-operative Education and Career Services if the petition concerns work term considerations, before making its decision. Students normally do not appear in person before the committee at the meeting at which the case will be considered; only if such an appearance will provide relevant information that cannot be communicated through the written petition and supporting documents will such an appearance be granted. Requests for personal appearances will be considered by the Associate Dean of Engineering for Undergraduate Studies.

Since a Petition for Special Consideration does not dispute an academic evaluation or application of the rules and regulations of the University, the decision of the Examinations and Promotions Committee with regard to petitions is final; there is no appeal of an unsuccessful petition. The Assistant Registrar for Engineering shall notify the student of the outcome of the petition within two weeks of the Examinations and Promotions Committee meeting at which the petition was considered.
Appeals
If the student believes that a decision or action is unfair, or that the student has been otherwise treated unfairly, or if the student believes that an academic evaluation or judgment is incorrect, that student may launch an Appeal. All appeals must be launched within six months either of being notified of an adverse decision or from the end of the term in which the alleged event(s) occurred. The first step of an appeal is always an informal inquiry. This may be followed by a formal inquiry, if warranted, and the formal inquiry may be followed by a formal appeal, if warranted.

A student shall initiate an informal inquiry by going directly to the appropriate instructor, officer, or University authority. The appeal will proceed beyond the informal inquiry stage only after evidence has been presented to the Associate Dean that a direct discussion between the student and the instructor, officer, or University authority has failed to produce agreement.

Within two weeks of receiving the response to the informal inquiry, or if there is no timely response, the student may submit an Application for Formal Inquiry (Form A) to the Associate Dean for Undergraduate Studies. The Application for Formal Inquiry is used both to appeal decisions and actions and to request a Formal Re-Read of a piece of work (e.g. an examination, thesis, project, work term report, course assignment, essay, laboratory report, etc.) in which the mark or assessment is questioned. The Associate Dean shall submit a copy of Form A to the Associate Chair of the department involved who shall conduct an investigation and submit a written report to the Associate Dean. The Associate Dean shall communicate the results of the Formal Inquiry to the student. In the case of a Formal Re-Read, the Associate Chair shall select a qualified new reader or readers who shall provide an assessment of the work using the marking scheme of the original instructor. The Associate Chair may decide that a re-read is not appropriate and shall so inform the Associate Dean, with reasons; otherwise, the Associate Chair shall determine from the evidence available to him/her, including the results of the re-read, the assessment that will be given to the work. The result can be a raising, lowering, or maintaining of the student's grade. The Associate Dean shall notify the student of the decision in writing and with reasons.

The next step, and the final one for appeals concerning academic judgment or assessment of a student's work, is the Formal Appeal. Within three weeks of receipt of the decision of the Formal Inquiry, the student shall submit an Application for a Formal Hearing before a Faculty Committee (Form B) to the Associate Dean for Undergraduate Studies. The Associate Dean shall inform the Chair of the Faculty Committee on Student Appeals who shall make the appropriate arrangements for a pre-hearing and hearing. For details regarding the pre-hearing and the hearing, the student is directed to the University Student Appeal Policy and Procedures.

English Language Proficiency Requirement
1. All students with an initial registration in the Faculty of Engineering in the Fall term of 1990 or later must satisfy the English Language Proficiency Requirement by the end of their 2A academic term or, if admission to the program occurs after the 2A term, before the end of his/her first academic term in the program.

2. The English Language Proficiency Requirement may be satisfied by one of the following:
   a) writing and obtaining a grade of 60% or better in the English Language Proficiency Examination (ELPE).
   b) taking an approved English course and obtaining a grade of 60% (C−) or better. A list of approved courses is maintained by the Director of General Studies of the Faculty of Engineering.
   c) in the case of admission to the program after the 2A term, providing evidence of proficiency in the form of courses successfully taken elsewhere, etc. that is acceptable to the home department in which the student is enrolled.

Students who have not satisfied the English Language Proficiency Requirement by the end of the appropriate term as specified in item 1 above will have their Academic Decision Deferred for that term. Continuation in the program is then contingent upon first satisfying this requirement.

3. Students who obtain a grade of less than 60% in the ELPE must, at the first available opportunity after their unsuccessful attempt at the ELPE, either attend the Writing Clinic or take one of the approved English courses:
   - English 109 Introduction to Essay Writing FWS
   - English 129R Introduction to Written English FWS
   - English 150 English as an Instrument of Thought and Communication FW
   - English 210 Report Writing FWS

The entry ARTS 000 will appear on both the Student Examination Report and the student's transcript with a CR grade if the student completes the requirement by passing the ELPE examination, or successfully fulfilling the requirements of the Writing Clinic or an approved English course.

Challenge for Credit
When students are able in their own time, or through experience in a work term job, to study the material of a course that they would normally be required to take in their program, they may show evidence as to why they should be excused from taking the course and demonstrate their competence in a manner acceptable to the department offering the course. This process is known as "Challenge for Credit". Additional information may be obtained from the student's department.
Undergraduate Co-operative Work-Term Reports
Satisfactory work reports and work terms are recognized formally as part of the requirements for the Bachelor's degree. The regulations related to work term reports are:

1. Prior to graduation each Engineering student is required to submit a minimum of 4 satisfactory work reports which must be related to the work of the term reported and must have identifiable analytic content. For those students admitted to advanced standing into 2B or 3A with only three work terms remaining, only three satisfactory work reports would be required.

2. Work reports are due seven days after the first official day of lectures of the academic term directly following the work term on which the report is based. Reports submitted after the deadline may be carried forward to the following calendar term for evaluation, and are not eligible for prizes.

3. Work reports are compulsory for all students in their first work term. The reports and evaluation forms shall be returned to the students and copies of the evaluation forms shall be placed in the students' files in the Department of Co-operative Education and Career Services.

4. Three additional work reports shall be submitted for the remaining five work terms. Students are encouraged to reserve a report for their final work term. If students wish, they may submit additional reports and the evaluations of these reports will be added to their work term record.

5. Work reports, other than those completed by first year students, shall be evaluated by the Engineering Faculty following the same procedure suggested in Item 3. This shall include reports marked by employers.

6. Work reports rated as unsatisfactory may be rewritten and re-submitted during the academic term. Students with unsatisfactory work reports may be required to take formal instruction in technical report writing.

7. Students who receive an 'NCR' designation for any work report on their Student Examination Report will not be promoted until they have cleared the condition. In addition, their registration for the next academic term will be cancelled, unless the next academic term is 4A (Fall) or 4B (Winter) (see Faculty of Engineering Supplement to Guidelines for Writing Your Work Term Report).

8. All required work-term reports must be submitted by March 1, if a student is to be eligible for the convocation in May of the same year.

Engineering
Examinations and Promotions
Compensatory Studies Requirements. Options and Electives for Engineering Students

Dean's Honours List
To recognize outstanding academic achievement each term, the designation "Dean's Honours List" will be awarded to exceptional undergraduate Engineering students. To achieve this standing, a student must be unconditionally promoted, and be either in the top 5% of the class or obtain a term average of at least 85%. This designation will be reflected on the student's mark report and official university transcript. Students not in the top 10% of the class, or not having a term average of at least 80% are normally not eligible.

Students with outstanding records throughout their undergraduate careers in Engineering will "Graduate on the Dean's Honours List" if they have been on the "Dean's Honours List" for at least two years of the six academic terms preceding graduation, and have a cumulative average over these last six terms of their program of at least 80%. An appropriate notation will appear on the student's official university transcript.

An Alumni Gold medal is awarded annually to recognize the academic excellence of the top undergraduate in Engineering.

Complementary Studies Requirements for Engineering Students

Each of the Engineering undergraduate programs consists of two course groupings:

1. The compulsory core program within the department which prepares the student for practice in that particular branch of engineering and comprises 70 to 80 percent of the course load.

2. Elective courses which comprise 20 to 30 percent of the course load. Of these elective courses a minimum of five must be chosen from subjects that complement the technical content of the engineering curriculum. This COMPLEMENTARY STUDIES requirement gives students some breadth of studies related to their role as educated professionals in society.

REQUIREMENTS
The requirement that a minimum of five courses must be taken that complement the technical content of the engineering curriculum can be met by either developing a self-planned grouping of courses or by following a pre-scheduled and recommended course grouping.

Self-Planned Complementary Studies
A student may plan an individual complementary studies grouping provided it meets these criteria:

1. It should consist of five courses which complement the engineering curriculum.

2. At least one of the courses must deal with the impact of technology on society. (See Courses on Impact of Technology on Society, below.)
3. It should include courses beyond the introductory level.

4. It is chosen from an approved list of elective courses for engineering students' complementary studies program below or,

5. The choice of courses is approved by the Associate Chair of the student's department.

The approved list of electives appears at the end of this section. Other courses may be approved by the department Associate Chair. Students who plan their own option package may have considerable difficulty with timetable conflicts.

Many courses are available by UW correspondence and may be taken during a student's work terms. Also, courses taken at another university during a work term may be eligible for "transfer of credit" if approved by the student's Associate Chair.

Pre-scheduled Humanities and Social Sciences Grouping

This grouping consists of a number of courses from the Humanities and Social Sciences which have been chosen to provide some understanding of the wider human and social context within which engineering is practiced. There are a number of choices within the grouping, most of which are pre-scheduled so that they do not conflict with the engineering core programs.

Students are recommended to take at least two courses from the listed Humanities courses and at least two from the Social Sciences list. The total must be five courses.

Pre-scheduled courses are listed in groups, one course at the introductory level and one or more at advanced level. A student's program should include courses beyond the introductory level.

In the following,

(F) Indicates Fall.

(W) Indicates Winter.

(S) Indicates Spring.

(I) Indicates introductory level.

(P) Indicates courses which will be scheduled into 11:30-12:30 MWF, 7:00-10:00 M or 7:00-10:00 T.

The choices are the following:

Social Sciences-based Courses

(P) Economics: (I) ECON 102 (F,W,S); ECON 202 (F,W,S)

(P) Management: (I) M SCI 211 (F,W,S); M SCI 311 (F,W); M SCI 461 (F,W)

General Engineering: GEN E 452 (W)

(P) Political Science: (I) PSCI 102M (W,S); PSCI 260A (F); PSCI 260B (W,S)

(P) Psychology: (I) PSYCH 101 (F,W,S); plus one term course to be announced (F,W)

(P) Sociology: (I) SOC 101 (F,W); SOC 265 (F,W)

Humanities-based Courses

(P) English: (I) ENGL 105A (F,W,S); ENGL 214 (F,W,S)

(P) French: (I) FR 195 (F); (I) FR 196 (W); FR 275 (F); FR 232 (W,S); FR 253 (W,S)

Engineering

Complementary Studies Requirements, Options and Electives for Engineering Students

(P) History: (I) HIST 130 (F,W,S); HIST 253 (F); HIST 254 (W,S)

(P) Philosophy: (I) PHIL 200A (F,S); PHIL 200B (W); PHIL 300X (W); PHIL 315 (W) (GEN E 412)

General Engineering: GEN E 411 (F,S); GEN E 412 (W) (cross-listed as PHIL 315)

Other Social Sciences and Humanities courses are permissible but will not be pre-scheduled. See Department Associate Chair for the approved list.

Courses on Impact of Technology on Society

At least one of the complementary studies courses must be in this area. A list of courses which meet this requirement is:

ANTH 102 Intro to Social and Cultural Anthropology
CLAS 384 Science and Technology of Ancient Greece and Rome
ERS 241 Introduction to Environmental and Social Impact Assessment
ERS 318 Case Studies in Sustainable Environmental and Resource Systems
GEN E 481 Engineering Technology and Canadian Society
PHIL 207 Science Technology and Society
SCI 253 Science and Society
SOC 232 Technology and Social Change
STV 100 Society, Technology and Values: An Introduction

Other courses may be acceptable for this requirement. Prior approval is required from your department Associate Chair.

Notes

1. Options and Electives available to engineering students are subject to change and development. Students are advised to obtain the latest information from their department Undergraduate Office or the Faculty of Engineering Associate Dean's Office before making final decisions.

2. Students who decide their preferred choices at pre-registration time are most likely to have their choice. Changes made at the beginning of a term may cause timetable conflicts and thus not be possible.

3. For descriptions of the content of courses see Chapter 16 of the UW calendar under the program prefix of the course e.g. CIV E – Civil Engineering, PHIL – Philosophy, GEN E – General Engineering, etc.
COMPLEMENTARY STUDIES ELECTIVE COURSES
Approved list of Elective courses for Engineering Students' Complementary Studies Program.

Notes
1. This list of courses has been approved by all engineering departments. Many additional courses are possible with department approval. In particular, approved language courses are not on this list.
2. In general, all literature and civilization courses in language departments are approved. Students who wish to take linguistics and grammar courses must be assessed by the language department to determine their facility with the language and approved by your home department Associate Chair. Linguistic courses may be very time consuming.
3. Courses approved for the English Language Proficiency requirements are not acceptable for the complementary studies program.

<table>
<thead>
<tr>
<th>Department</th>
<th>Courses Accepted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accounting (ACC)</td>
<td>131, 132 but not with Management Sciences Option</td>
</tr>
<tr>
<td>Anthropology (ANTH)</td>
<td>All</td>
</tr>
<tr>
<td>Canadian Studies (CDN ST)</td>
<td>All</td>
</tr>
<tr>
<td>Civil Engineering (CIV E)</td>
<td>491 only</td>
</tr>
<tr>
<td>Classical Studies (CLAS)</td>
<td>All</td>
</tr>
<tr>
<td>Dance (DANCE)</td>
<td>* see home department Associate Chair, but not 242, 342</td>
</tr>
<tr>
<td>Drama (DRAMA)</td>
<td>101A, 101B, 251</td>
</tr>
<tr>
<td>East Asian Studies (EASIA)</td>
<td>201R</td>
</tr>
<tr>
<td>Economics (ECON)</td>
<td>All except 211, 221, 311, 321, 404, 411, 421, 422, 471</td>
</tr>
<tr>
<td>English (ENGL)</td>
<td>All except 109, 110, 129R, 140R, 141R, 150, 151, 240R and also not those approved for the English Language Proficiency requirement</td>
</tr>
<tr>
<td>Environmental Studies (ENV S)</td>
<td>195, 201, 310, 500</td>
</tr>
<tr>
<td>Fine Arts (FINE)</td>
<td>* see home department Associate Chair</td>
</tr>
<tr>
<td>General Engineering (GEN E)</td>
<td>315, 411, 412, 415, 452, 481 (411 only 4th year CHE, COMP, EE, SD students)</td>
</tr>
<tr>
<td>Geography (GEOG)</td>
<td>101, 120, 202A, 203, 204, 205, 206, 221, 227</td>
</tr>
<tr>
<td>Gerontology (GERON)</td>
<td>208</td>
</tr>
<tr>
<td>Health Studies (HLTH)</td>
<td>220, 348, 349</td>
</tr>
<tr>
<td>History (HIST)</td>
<td>All except 400-level courses</td>
</tr>
<tr>
<td>Kinesiology (KIN)</td>
<td>103, 252, 348, 349, 352, 354</td>
</tr>
<tr>
<td>Management Sciences (M SCI)</td>
<td>211, 311, 441, 461</td>
</tr>
<tr>
<td>Mechanical Engineering (M E)</td>
<td>401 (Mechanical Engineering only), 502</td>
</tr>
<tr>
<td>Music (MUSIC)</td>
<td>(100 or 150/151), 125, 231, 272, 273, 274, 275, 280, 332, 353, 354</td>
</tr>
<tr>
<td>Peace and Conflict Studies (PACS)</td>
<td>All</td>
</tr>
<tr>
<td>Personnel Studies (PERST)</td>
<td>All (cannot be taken if M SCI 211 or 311 taken)</td>
</tr>
<tr>
<td>Philosophy (PHIL)</td>
<td>All except 140 and 440A/B</td>
</tr>
<tr>
<td>Planning (PLAN)</td>
<td>156, 230</td>
</tr>
<tr>
<td>Political Science (PSCI)</td>
<td>All except 214, 315</td>
</tr>
<tr>
<td>Psychology (PSYCH)</td>
<td>All except 200, 261, 291, 292, 391-98, 400-level courses need approval of Psychology Department</td>
</tr>
<tr>
<td>Recreation (REC)</td>
<td>100, 201, 204, 205, 230, 250, 300, 304</td>
</tr>
<tr>
<td>Religious Studies (RS)</td>
<td>All</td>
</tr>
<tr>
<td>Sexuality, Marriage and the Family (GMF)</td>
<td>All</td>
</tr>
<tr>
<td>Social Development Studies</td>
<td>All</td>
</tr>
<tr>
<td>Interdisciplinary Social Science (ISS)</td>
<td>All except 250R, 251R, 398R, 399R, 499</td>
</tr>
<tr>
<td>Society, Technology and Values (STV)</td>
<td>All</td>
</tr>
<tr>
<td>Sociology (SOC)</td>
<td>All except 321, 322, 380, 384</td>
</tr>
<tr>
<td>Women's Studies (WS)</td>
<td>All</td>
</tr>
</tbody>
</table>

* In general, non-studio courses are approved. Students wishing to take studio courses must obtain approval from the home department and be assessed by the department offering the studio. Studio courses may be very time consuming.

4. Only courses which are listed on the "Prescheduled Complementary Studies Electives" list will be guaranteed conflict-free.
5. Students are responsible for ensuring they have suitable background.
6. From time to time some courses may be restricted to students in particular programs.
7. Department course offerings may change. Courses not listed will be individually judged by the Associate Chair of the student's department.
8. Associate Chairs may change the course category for the program of individual students who are special cases.
OPTIONS AND ELECTIVES FOR ENGINEERING STUDENTS

1. Each of the Engineering undergraduate programs consists of two course groupings:
   a) The compulsory core program within the department which prepares the student for practice in that particular branch of engineering and comprises 70 to 80 percent of the course load.
   b) Elective courses which comprise 20 to 30 percent of the course load. Of these elective courses a minimum of five must be chosen from subjects that complement the engineering curriculum. This Complementary Studies requirement gives students some breadth of studies related to their role as educated professionals in society. (See Complementary Studies Requirement section.)

In the elective courses, students with special interests may, with the approval of their department Associate Chair, structure individual groupings. However, for reasons of academic continuity and scheduling, particular course groupings have been identified and are recommended to students. Some of these course groupings are pre-scheduled to ensure that courses in the group will not conflict with core courses.

2. The remaining elective courses are usually chosen from engineering department courses which will give some depth in a particular technical discipline appropriate to a student's branch of engineering. (See Engineering Departments' program descriptions for listings of suggested elective course groupings of this type.)

3. Designated Options. Certain elective course groupings have been recognized by the Faculty of Engineering or the University as DESIGNATED OPTIONS. Students who complete the requirements of these options will have a designation of completion of the option recorded on their transcripts. At present the available options and the corresponding option co-ordinators are the following:

<table>
<thead>
<tr>
<th>Option</th>
<th>Co-ordinator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics</td>
<td>G. Greig, Systems Design</td>
</tr>
<tr>
<td>Physics</td>
<td>J. Hanson, Elec. and Computer Engineering</td>
</tr>
<tr>
<td>Computer Engineering</td>
<td>J. Hanson, J. Field, Elec. and Computer Engineering</td>
</tr>
<tr>
<td>Statistics</td>
<td>C. Young, Stat. and Actuarial Science or K. Hipel, Systems Design Engineering</td>
</tr>
<tr>
<td>Water Resources Management Sci.</td>
<td>N. Kouwen, Civil Engineering</td>
</tr>
<tr>
<td>Society, Technology and Values</td>
<td>J.B. Moore, Management Sci.</td>
</tr>
<tr>
<td>International Studies in Engineering</td>
<td>Director of General Studies, Faculty of Engineering</td>
</tr>
<tr>
<td></td>
<td>H.C. Ratz</td>
</tr>
</tbody>
</table>

Because Designated Options can require up to eight courses, it may be necessary for students to take extra courses to complete the required work in some options. To carry extra courses, a student's academic standing must be such that the extra load will not lead to a high risk of failure, and permission of the Department Associate Chair must be obtained.

For a designation to appear on the transcript a student must achieve an average of 60% in the Option courses and a grade of 50% in each of the courses in the option. Details follow later in this section.

4. Although Engineering does not offer "MINORS" in its departments many other departments of the University do. A Minor requires a minimum of ten courses chosen from lists prepared by the departments. Engineering students who choose a Minor must take extra courses. However, often courses in a Minor can also be used to satisfy some of the requirements of the technical elective or complementary studies course groups.

5. It is possible for a graduate with a BASc degree in Engineering to complete the requirements for a non-major General BA in a further two terms of study. Assuming satisfactory grades and the appropriate choice of Complementary Studies Electives, credit for liberal Arts and Science courses (including mathematics and science subjects in Engineering) may be transferred to meet up to two-thirds of the General BA requirement. Students interested in pursuing such a program should consult with their Department Associate Chair or the Director of General Studies for Engineering, and the Associate Dean of the Faculty of Arts for Undergraduate Affairs.

6. The Faculty of Engineering, University of Waterloo, has student exchange programs with Engineering Schools in other countries. These permit Waterloo students to experience study in different cultural environments, and to receive academic credit towards their program requirements. Such exchanges are currently active with Université de Technologie de Compiègne, Technische Universität Braunschweig, the New South Wales Institute of Technology, New University of Ulster, University of Technology (Sydney), University of Leeds, Universität Gesamthochschule Paderborn, Tottori University, University of Hull (England), University of Nantes (France), Pohang Institute of Science and Technology, and École Polytechnique Fédérale de Lausanne.

Notes

1. Options and Electives available to engineering students are subject to change and development. Students are advised to obtain the latest information from their department Undergraduate Office or the Faculty of Engineering Associate Dean's Office before making final decisions.

2. Students who decide their preferred choices at pre-registration time are most likely to get their choice. Changes made at the beginning of a term may cause timetable conflicts and thus may not be possible.
3. For descriptions of the content of courses see Chapter 16 of this calendar under the program prefix of the course e.g. CIV E – Civil Engineering, PHIL – Philosophy, GEN E – General Engineering, etc.

DETAILS OF DESIGNATED OPTIONS

Option in Mathematics
The aim of the mathematics option is to provide the student with a broad background in either pure or applied mathematics with an opportunity to take some courses in an area of specialization.

There are six required courses:

- MATH 211 Advanced Calculus 1 (or equivalent)
- MATH 212 Advanced Calculus 2 (or equivalent)
- E & CE 316 Probability and Statistics (or equivalent)
- MATH 235 Linear Algebra 2
- either
  - PMATH 334 Introduction to Rings and Fields
  - or PMATH 336 Introduction to Group Theory
- either
  - AM/PMATH 331 Real Analysis
  - or AM/PMATH 332 Complex Analysis

A student must additionally take two courses from the following, subject to availability and timetable constraints.

- AM 331/PMATH 331 Real Analysis
- AM 332/PMATH 332 Complex Analysis
- AM333/PMATH 365 Differential Geometry and Tensor Analysis
- AM 351 Ordinary Differential Equations
- AM 353 Partial Differential Equations 1
- AM 361 Continuum Mechanics
- AM 371C Classical Mechanics
- AM 381C/PMATH 380A Introduction to Information Theory
- AM 481C/PMATH 380B Applications of Information Theory
- PMATH 334 Introduction to Rings and Fields
- PMATH 336 Introduction to Group Theory
- PMATH 340 Elementary Number Theory
- PMATH 360 Geometry
- PMATH 367 Set Theory and General Topology
- PMATH 430A Introduction to Mathematical Logic 1
- PMATH 430B Introduction to Mathematical Logic 2
- C&O 230 Introduction to Combinatorics
- C&O 342 Graph Theory 1
- C&O 350 Linear Programming
- C&O 367 Nonlinear Programming

The list of courses will be subject to change from time to time. For further information contact the option co-ordinator.

Option in Physics
The physics option is intended for students who want to have a better background in the fundamentals of physical science than is available in the regular program.

Option in Statistics
The aim of the statistics option is to provide the student with a broad background in applied statistics, especially in the areas of multiple regression, quality control, experimental design and applied probability.

There are five required courses:

- PHYS 115 Mechanics
- PHYS 125 Physics for Engineers
- PHYS 234 Quantum Physics 1
- PHYS 334 Quantum Physics 2
- M E 250 Thermodynamics
- or
- PHYS 358 Thermodynamics

A student must additionally take three electives from Group A or three electives from Group B, subject to availability and timetable constraints.

- Group A
  - PHYS 259 Crystallography and X-Ray Diffraction
  - PHYS 359 Statistical Mechanics
  - PHYS 364 Mathematical Physics 1
  - PHYS 365 Mathematical Physics 2
  - PHYS 434 Introductory Quantum Mechanics
  - PHYS 435 Solid State Physics
  - PHYS 442 Structure of Solids
  - PHYS 443 Continuum Mechanics
  - PHYS 455 Nuclear and Particle Physics

- Group B
  - PHYS 350 Astrophysics 1
  - PHYS 364 Mathematical Physics 1
  - PHYS 365 Mathematical Physics 2
  - AM 475 Introduction to General Relativity
  - PHYS 445 Modern Optics
  - PHYS 476A-Z Special Topics in Astrophysics

The list of courses in Groups A and B will be subject to change from time to time. For further information, contact the option co-ordinator.

Option in Computer Engineering
This is a Designated Faculty Option which is available to students in Electrical Engineering and Systems Design Engineering to give greater training in software and to augment digital hardware capabilities. For details of this option students are referred to the Electrical and Computer Engineering and Systems Design Engineering sections of this calendar.

Option in Statistics
The aim of the statistics option is to provide the student with a broad background in applied statistics, especially in the areas of multiple regression, quality control, experimental design and applied probability.

There are five required courses:

- STAT 231 Statistics (or equivalent, e.g. SY DE 214, M E 202, CH E 022, CIV E 224)
- STAT 331 Applied Linear Models (or equivalent, e.g. SY DE 333)
- STAT 333 Applied Probability or STAT 430 Experimental Design
- STAT 335 Statistical Process Control

A student must take three additional courses from those listed below:

- STAT 230 Probability (or equivalent, e.g. SY DE 213)
- STAT 332 Sampling
Option in Water Resources

This option is for students interested in the development, management and protection of water resources. Students are prepared for careers with consulting firms or regulatory agencies. They acquire the background to design and evaluate hydraulic structures, pollution control schemes and water management systems. They are also exposed to the social and environmental aspects of use of water resources. A minimum of seven courses is required. However most students in Civil Engineering will probably wish to take more.

There are four required courses.

- CIV E 280 (or equivalent) Fluid Mechanics
- CIV E 375 Water Quality Engineering
- CIV E 381 Hydraulics
- CIV E 486 Hydrology

A minimum of three elective courses is required to be taken from the following list, subject to timetable constraints.

**Surface Water**
- CIV E 473 (W) Contaminant Transport
- CIV E 483 (W) Design of Urban Water Systems

**Treatment**
- CIV E 472 (F,S) Waste Water Treatment
- CH E 032 (W,S) Introductory Biotechnology
- CH E 574 (W) Treatment of Aqueous Inorganic Wastes

Option in Management Sciences

This Designated Option consists of a mixture of courses, some of which are technical in nature, and some of which qualify as complementary studies courses. The option is available in all engineering programs except Geological. It is intended for students interested in the issues, concepts and techniques related to managerial problems, particularly in technologically-based organizations. The option consists of:

**Required courses or their equivalents:**
- M SCI 251 Probability and Statistics
- M SCI 261 Managerial and Engineering Economics 1
- M SCI 331 Operations Research 1
- M SCI 211* Organizational Behaviour 1 (Complementary Studies Course)

plus three of the following or equivalent:
- M SCI 311* Organizational Behaviour 2 (Complementary Studies Course)
- M SCI 431 Operations Research 2
- M SCI 432 Introduction to Production
- M SCI 441* Management Information Systems
- M SCI 452 Behavioural Decision Analysis
The Option in International Studies in Engineering provides an enriched educational program by focusing on the global nature of engineering. Besides providing a wider appreciation of cultural diversity, it provides a background that is not possible in the classroom alone. The Faculty Option will probably require extra academic material on campus, and will certainly require overseas work and study. It will provide a life-long benefit for those students who are inclined and able to seek enrichment in their education.

The option will consist of academic requirements on the UW campus, together with study terms or work terms, or both, at overseas locations.

1. **Academic requirements** on the UW campus: this component may involve language and cultural studies (history and literature) as part of an integrated program for the individual student. To be accepted for the option designation of International Studies in Engineering, the complete program must be approved by the co-ordinator of the option.

   The subjects that are studied before the overseas experience would normally be related to the language, literature, and culture of the country of destination. The subjects studied upon return would normally be directed towards integrating the experience into the broader perspective through courses in international economics, history, or politics.

2. **Study terms, or work terms**, or both, in overseas institutions and industries, are approved by the option co-ordinator, and the exchange program co-ordinator where an exchange program is involved. Normally, at least two terms will be spent abroad. In the case of overseas study terms, credit may be transferred to the student's UW program on a course by course basis, as approved (normally in advance) by the department of the student’s registration.

**Program**

1. Students must enroll as option candidates before undertaking any option requirement. Enrolment requires the approval of the option co-ordinator, and normally will be limited to students who maintain a 70% average. The requirements of the option are GEN E 303, and six other courses as specified in (2) and (4) below.

2. Three UW courses will normally be required before leaving for abroad, which normally will not occur before the 3A term is complete. These subjects will be specified according to the country of destination, and will include literature, history, and regional studies, as well as language preparation.

3. The second part of the program is an overseas experience of at least two terms, including study terms or work terms, or both. An acceptable written report is required, and would earn the equivalent of a course credit towards the requirements of the option under GEN E 303. The student would register in GEN E 303 in the first academic term upon return.

4. The final part of the program is at least three UW courses, or the equivalent, from an approved list that
complete the requirements of the International Studies option. These must be approved by the option co-ordinator, and would be directed towards integrating the overseas experience into the broader perspective through courses in international economics, history or politics.

For further information regarding this option, contact the option co-ordinator.

Environmental Engineering Program and Option

There are definitive plans in place with regard to the establishment of an Environmental Engineering program at the University of Waterloo in addition to an Environmental Engineering Option within the Faculty of Engineering. Implementation of such a program and Option requires numerous levels of academic approval both within and outside of the University; the Option can be handled entirely within the University, while the program must seek approval from the Ontario Council of University Affairs of the Ministry of Colleges and Universities. The plan is to move forward on two fronts: 1) formalize an Environmental Option within the faculty, in which students can enrol, which will not necessarily vanish upon approval of the program, and which will serve as a transition towards the Environmental Engineering program and 2) begin the processes necessary to establish the Environmental Engineering program. With regard to the former this process has begun; a Committee has been struck whose members have submitted information relevant to the proposed “theme areas”. It is anticipated that the Option package will make its way through the approval processes and be available to students by the Winter term of 1991. Conversely, the Environmental Engineering program requires substantially more preparation, and approvals must be obtained throughout the University administrative and academic structure as well as from the Ministry itself. The Environmental Engineering program is therefore expected to be available to students beginning only in the Fall term of 1992. However, those students who enrol in the Option, if they choose their courses in an appropriate manner, would be strong candidates to make transition directly from the Option into the program and hence newly admitted students, even though an Environmental Engineering program does not exist at present, may indeed qualify for graduation as an Environmental Engineer.

Details for both the Option and the program are not available at the present time in a finalized form, and any students interested in pursuing this avenue are encouraged to inquire at the Engineering Undergraduate Office regarding the Option, after January of 1991, and for the program inquire after the Fall of 1991 in order to determine the status of the program at that point in time and a more definitive estimate of the actual implementation time period.

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Combined Bachelor's - Master's Program

In Engineering

The Faculty of Engineering offers a combined Bachelor's - Master's Program. The program is a response to a number of needs among which are:

- recognition of outstanding students and provision of academic enrichment for them;
- provision of an introduction to the postgraduate milieu for good undergraduate students who might otherwise overlook the opportunity of graduate studies;
- provision of a reasonably firm time horizon for the completion of the MASc program.

This program provides a mechanism for the institution of a quicker route to the MASc degree, for outstanding students, on a Faculty-wide basis. The framework is a minimum requirement and departments may add to, but not delete from the requirements of the program.

GENERAL PRINCIPLES OF COMBINED BACHELOR'S - MASTER'S PROGRAMS

A combined Bachelor's - Master's program is one in which it is deemed academically advantageous to treat the educational process leading through the BASc to the MASc degree as a single continuous integrated whole, while at the same time satisfying the requirements for both degrees. This stands in contradistinction to treatment of the Bachelor's and Master's degree programs each as terminal activities. Such structured programs, starting at the undergraduate level and terminating with a MASc degree in the Faculty of Engineering provide an alternative means, complementary to the existing undergraduate and graduate programs, for the attainment of the MASc degree.

The following are some general conditions that all such combined Bachelor's - Master's degree programs should satisfy:

1. Students who elect to enter and pursue the combined Bachelor's - Master's programs will fulfill the degree requirements of both the BASc program and the MASc program. This implies that:
   a) eight terms of full-time registration at the undergraduate level and at least two terms of full-time registration (or equivalent) at the graduate level are mandatory;
   b) the graduate program must include at least four (graduate) courses and a thesis, or eight courses and a MASc project.
   c) the Co-operative work term requirements of the BASc program must be met.

2. There must be complete freedom of transferability from the combined programs to the regular programs.

3. Admission to the combined program is on the basis of merit, as is continuance in the program. Students who fail to maintain sufficiently high standing will be required to revert to the regular program, or if circumstances so warrant, to withdraw from the University.
4. The culmination of the combined program is the Master's degree; this may be attained either through the completion of a Master's degree project or research thesis.

5. A combined program normally functions on a Co-operative basis.

6. Recruitment into a combined Bachelor's - Master's degree program must have the flexibility to satisfy the requirements of individual students; at the same time it must have coherence - each student's program must be addressed toward a well-defined area of specialization.

**ORGANIZATIONAL STRUCTURE FOR THE COMBINED BACHELOR'S - MASTER'S PROGRAM**

**Application and Admission**
Admission to the combined Bachelor's - Master's degree program is normally restricted to students with a consistently good academic record at the end of the 3A term who would be granted "conditional admission to the MASc program." The condition to be fulfilled is "satisfactory completion of the requirements of the BASc degree with at least a B average."

Students who are granted this admission would be notified at the start of the academic term preceding their 6th work term. As in any program culminating in a Master's degree, a Faculty Supervisor is appointed on admission.

**Academic and Administrative Responsibility**
Although the Supervisor advises students, all course selections and other academic administrative matters concerning each student are subject to the approval of the Department Associate Chair for Undergraduate and Graduate Studies.

**Course Programs**
The courses chosen by the student (with the advice of the Supervisor and approval of the Associate Chair) in the 4A, 4B, 5A, and 5B terms should form a coherent series which (together with the MASc project or thesis) complete the requirements of the Bachelor's and, ultimately, the Master's degree.

In each of the 4A and 4B terms one course (normally 600 level) should be chosen for credit to the MASc degree. In some departments this course may replace one of the technical electives in each of those terms. Technically, it is necessary for students to register for these courses as "extras" in order to avoid counting them towards the requirements of both degrees.

If a student is proceeding to an MASc with a research thesis, the balance of courses (2 courses numbered 500 or above) will normally be taken in the 5A (Fall) term. There will be no course requirement for the 5B (Winter) term.

A student who is proceeding to a MASc with a Master's degree project, would normally select 3 courses in each of the 5A and 5B terms (with the advice of the Supervisor and approval of the Associate Chair).

**Co-operative Work Terms**
The combined Bachelor's - Master's program includes two work terms. These may take two forms:

1. **"Special" Off-Campus Work Terms**
   It is expected that most of the students proceeding to the MASc degree by course work and project will be involved in off-campus work terms. Because of the calibre of these students it should be possible to make special arrangements for significant projects to be completed in these terms, so that they form a coherent pair, and that the students have special supervision in industry. The "work reports" generated on the "special" work terms will form the basis for the MASc project report. The Faculty Supervisor will be expected to maintain liaison with the off-campus organization in which the student works during these terms.

2. **"Special" On-Campus Work Terms**
   It is expected that most of the students proceeding to the MASc degree with a research thesis will be involved in on-campus work terms. During these work terms they will not be registered students; they may be hired as associate researchers for the purposes of various research grants, without the restriction of student salaries. They may also work as teaching assistants during these terms. This combination can be attractive from the various points of view of available research time, income generation for the student, total research cost from a grant and effective teaching assistantships.

**Fourth-Year Projects**
All Departments have some requirement or opportunity for projects in the 4A/4B terms. For students in the combined Bachelor's - Master's program these projects may be integrated with their special work term projects as well as their work in 5A and 5B.

**Granting of Degrees**
The BASc degree will be granted at the normal time i.e. at the Spring Convocation following the 4B term. The program, however, culminates in the MASc, which is normally granted at the Convocation following the 5B term. In some cases, additional time may be required to complete the thesis or project.

**Postgraduate Scholarships**
Students in the combined Bachelor's - Master's program may apply for NSERC, OGS, CMHC scholarships, etc. at the same time as their colleagues in the Regular programs. They are also eligible for FOB scholarships during the 5A and 5B terms.

**Withdrawal or Failure**
Students may remain in the combined Bachelor's - Master's program provided they maintain sufficiently high academic standards. The minimum is a cumulative B average (73% to the end of 4B, 70% thereafter). A student who fails to maintain this standard will be required to withdraw from the combined degree program.
In such a case, all courses taken up to the end of 4B, including those originally intended to fulfill part of the Master's degree requirements, will be counted towards the Bachelor's degree program and marks therefrom included in the 4A and 4B averages as appropriate. Should the student have then satisfied the requirements for the BASc degree, it will be granted at the next convocation. Such a student will not be permitted to enter the regular MASc program.

If a student does maintain at least the minimum standard mentioned above, but decides to withdraw voluntarily from the combined Bachelor's - Master's program, the 4A and 4B results will be calculated including the courses originally intended to fulfill part of the Master's degree requirements, and if the requirements for the Bachelor's degree are then satisfied, the BASc will be granted at the next Convocation. Such a student will be allowed, at a later date, to enter the regular MASc program, but the graduate courses taken in the final undergraduate year may not be applied to the Master's degree.

First Year Engineering Programs

All students enrolling in First Year Engineering are required to choose one of the following programs:

Chemical Engineering
Civil Engineering
Computer Engineering
Electrical Engineering
Geological Engineering
Mechanical Engineering
Systems Design Engineering

Students enrolling in a First Year Engineering program (other than Systems Design) must register in the courses indicated in the following table: (Course descriptions can be found in Chapter 16.)

**Term 1A**
- MATH 114
- MATH 116
- CH E 102
- PHYS 115
- GEN E 170 (except Chemical Engineering)

and one of
- CH E 100, GEN E 163, GEN E 165, GEN E 167

**Term 1B**
- MATH 118
- PHYS 125
- GEN E 121
- GEN E 123

and one of
- CIV E 126, E&CE 126, CH E 101, GEO E 126, M E 126

Chemical Engineering

Chemical Engineering is the responsible application of science to develop processes or systems for the economic production and distribution of beneficial materials through the physical, chemical, or biochemical transformation of matter.

Chemical Engineers combine a sound background in fundamental understanding of science and mathematics with highly-developed problem-solving skills to improve existing processes or methods, or to implement new ones. The principles of economic production and distribution differentiate engineering activities from those of science. Chemical engineers will be required for many exciting new developments during the next few decades.

Chemical engineers design, analyse, optimize and control processing operations, or guide others who perform these functions, in industry, government, universities or private practice.

Activity areas include:

**Energy:** conservation, improved production and use of renewable and non-renewable resources.

**Materials:** minerals; fertilizers; petrochemicals; biochemicals; processed foods; paints; pulp and paper; polymers; textiles; etc.

**Environment:** pollution control; recycling; environmental safety and regulations; etc.

**People:** management functions; group leader, plant manager, research director, president; etc.

In a world faced with growing shortages of non-renewable resources and a finite limit on the amounts of renewable resources, persons wishing to use their talents to optimize the recovery or utilization of matter and energy will find Chemical Engineering a challenging and satisfying career, one which will place them in enviable positions with respect to the availability of employment opportunities.

In recent years, significant numbers of women are entering the engineering profession and this trend is increasing as they become more aware of the career opportunities available. More women now enter Chemical Engineering than any other branch of engineering.

Waterloo offers the student a first-rate opportunity to obtain a sound, relevant background in the discipline of Chemical Engineering. The Department of Chemical Engineering at the University of Waterloo is one of the largest and most active departments in North America. There are over 30 full-time faculty, each of whom specializes in a particular sub-field through research and
consulting activities, thereby bringing depth as well as breadth to the instruction and professional development of students.

Chemical Engineering at Waterloo is a co-operative education program and offers many advantages:

- an opportunity through work terms to gain exposure to a variety of job-related experiences within Chemical Engineering
- work term salaries effectively reduce the costs associated with university education
- Waterloo graduates receive favourable recognition from employers for their work term experiences
- work terms can offer an opportunity to travel through a worldwide network of co-op employers
- academic terms become more meaningful and relevant against a background of work term related experience

THE WATERLOO CHEMICAL ENGINEERING CURRICULUM

The main emphasis in the first and second year is on courses in science and mathematics which provide the foundations upon which engineering skills can be built. The upper-year core and elective courses assume and require this background.

Engineering is both a quantitative and an applied discipline, requiring the skill to be able both to set up the mathematical equations which describe a process and then to solve the equations to analyse and predict its behaviour. This requires a strong mathematical ability. Courses in Calculus, Algebra, Computer Science, Differential Equations, and Statistics help develop this ability. More specialized Engineering Mathematics courses extend into the third year.

To perform successfully, the Chemical Engineer must be able to design, analyse, and control processes to produce useful and desirable products from less valuable raw materials in an efficient, economic, and socially responsible way. The knowledge and skills essential for achieving these goals are developed in the core Chemical Engineering courses taken mainly in the third and fourth years (e.g., in fluid mechanics, process flowsheeting, heat and mass transfer, thermodynamics, reactor design, biotechnology, process control, process and equipment design, engineering economics). Most of these courses are a mixture of theory and practice. Detailed computer simulations are used in several courses to reinforce the theoretical principles.

All students in the fourth year do either an individual research or design project, or a group process design project in direct collaboration with one of their professors. Numerous Canadian companies also sponsor projects.

The range of subject matter within Chemical Engineering is much too extensive to be mastered by any one student during the four-year program. Consequently, in the fourth year, a student may select several technical elective courses to further develop her/his understanding of, and ability to use, engineering principles applied to important Canadian industrial sectors.

Many of these electives are grouped within a common specialty theme which is covered in some depth. Students are required to take at least one of the elective themes which are described briefly below. The remaining technical elective requirements can be met by taking additional packages, or approved courses of interest either within the Department or elsewhere in the University.

An important component of the development of a professional engineer, which receives emphasis throughout the entire four-year curriculum, is frequent practice in learning to communicate technical results clearly, accurately and effectively to others. Written practice is provided in the requirement for co-op work term reports which are graded by faculty. Written and oral report requirements in laboratory and other courses provide additional practice opportunities.

COMBINED BACHELOR'S - MASTER'S PROGRAM IN CHEMICAL ENGINEERING

Provision is made for outstanding students to pursue a combined Bachelor's - Master's Program. This program provides a quicker route to the MASc degree. Admission is normally granted to qualified students possessing a consistently good cumulative academic record at the end of the 3A term. See "Combined Bachelor's - Master's Program in Engineering", page 10:14, for more details.

AREAS OF SPECIALIZATION AVAILABLE IN CHEMICAL ENGINEERING

Transport Processes

As an extension of the core curriculum, this covers advanced aspects and industrial applications of fluid flow, heat transfer, mass transfer, reaction kinetics and petroleum engineering.

Mathematical Analysis, Statistics and Control

This also deals with the further development of a core area of Chemical Engineering. It involves studies in optimal control, economic and process optimization, simulation, and statistics. Dedicated computer process laboratory and state-of-the-art industrial software systems provide excellent vehicles for learning.

Polymer Science and Engineering

This elective theme has a wide scope, but special emphasis is placed on the physics and physical chemistry of polymers, and on the modifications of polymer structure by physical or chemical means.

Extractive and Process Metallurgy

This involves the application of Chemical Engineering principles to metallurgical processes in order to improve many of the pyrometallurgical, electrolytic and hydrometallurgical processes presently used in Canada. Chemical metallurgy is inter-related with these principles for overall process design and development.

Biochemical Engineering (Industrial Biotechnology)

This theme deals with the processing of systems where biochemical phenomena are important. It is concerned with
fermentation operations and equipment which manufacture products such as alcoholic beverages, yeasts, antibiotics, therapeutics, vitamins and enzymes, often using genetically-engineered organisms, and with waste treatment and food processing.

**Pollution Control Engineering**
This elective package presents aspects of industrial waste treatment and pollution abatement techniques which are becoming increasingly important for the proper use of technology in a quality conscious society.

**COMPLEMENTARY STUDIES ELECTIVES (CSE's)**
Five one-term courses in non-technical areas (that is, outside the engineering, sciences and mathematics disciplines) must be taken. This requirement is organized on a Faculty basis and is detailed elsewhere in this Engineering Chapter (see page 10:7). If some Complementary Studies Electives are satisfied by correspondence or from other institutions on Letters of Permission, each term's minimum course load must be maintained by substituting an approved "free" elective (technical or non-technical).

**OPTIONS AND MINORS**
A number of Faculty or University Designated Options available to Engineering students are listed and described elsewhere in this Engineering Chapter (see pages 10:10 to 10:14 and page 10:28). Students who satisfy the option requirements (usually seven or eight courses) will have the appropriate designation shown on their transcript.

Minors are sequences of courses, usually totalling ten, which are arranged in conjunction with another department such as Economics, Biology, Psychology, etc. and lead to an appropriately designated degree. Approval from both Chemical Engineering and the other department is required.

Usually students must take extra courses to complete a Minor or a Designated Option.
## Academic Program

### Term 1A, Fall
- **CHE 100** Chemical Engineering Concepts 1 (units and mass balances)
- **CHE 102** Chemistry for Engineers (stoichiometry to kinetics)
- **MATH 114** Algebra and Vector Geometry (matrices to vector spaces)
- **MATH 116** Calculus 1 (derivatives to applications of integration)
- **PHYS 115** Mechanics (statics, kinematics to angular momentum)

### Term 1B, Winter and Spring
- **CHE 101** Chemical Engineering Concepts II (units and energy balances)
- **GEN E 121** Digital Computation (computers and Fortran programs)
- **GEN E 123** Electrical Engineering (electricity and circuits)
- **MATH 118** Calculus 2 (power series, O.D.E.'s and multiple integrals)
- **PHYS 125** Waves (oscillations, optics and quantum physics)
- **CSE XX1** ECON 101K, SOC 101, PSYCH 101, ENGL 105A, FR 196, HIST 130, PHIL 200B, STV 100 or other approved elective

### Term 2A, Fall and Winter
- **CHE 021** Transport Processes 1 (separation processes)
- **CHE 022** Applied Mathematics 1 (statistics)
- **CHE 023** Physical Chemistry 1 (thermodynamics to phase equilibria)
- **CHEM 026** Organic Chemistry 1 (aliphatic compounds and preparations)
- **MATH 210** Advanced Calculus (gradients to integral theorems)

### Term 2B, Spring and Fall
- **CHE 025** Transport Processes 2 (fluid mechanics)
- **CHE 026** Physical Chemistry 2 (thermodynamics to kinetics)
- **CHEM 036** Organic Chemistry 2 (industrial organic processes)
- **MATH 216** Differential Equations (O.D.E.s and Laplace transforms)
- **CSE XX2** (M SCI 211) ENGL 210C or other approved elective

### Term 3A, Winter and Spring
- **CHE 030** Transport Processes 3 (heat transfer)
- **CHE 031** Process Flowsheeting (modelling and CAD)
- **CHE 032** Introductory Biotechnology (foods to genetic engineering)
- **CHE 033** Chemical Engineering Thermodynamics (applications)
- **CHE 034** Inorganic Process Principles 1 (acids to metallurgy)
  - *(M SCI 331)* *(extra for Management Science Option, take in any term prior to 4B)*

### Term 3B, Fall and Winter
- **CHE 035** Transport Processes 4 (mass transfer)
- **CHE 036** Chemical Reaction Engineering (theory of reactor design)
- **CHE 037** Applied Mathematics 2 (applied ordinary and partial D.E.s.)
- **CHE 038** Inorganic Process Principles 2 (electrolysis to corrosion)
  - *(CSE XX3)* *(M SCI 311)* Approved elective

### Term 4A, Spring and Fall
- **CHE 040** Unit Operations Laboratory (separators and reactors)
- **CHE 041** Introduction to Process Control (transfer fns. to computer control)
- **CHE 043** Individual Research Project begins
- **CHE 044** Engineering Economics (money value to optimal analysis)
- **CSE XX4** *(M SCI 461)* GEN E 411 or other approved elective

### Term 4B, Winter
- **CHE 047 or 048** Team Project or continuation of CHE 043
- **CHE 5X1** Technical elective from 1 area of specialization below
- **CHE 5X2** Technical elective from same area
- **CHE 5X3** *(M SCI 432)* Technical elective from another area or another department
- **CSE XX5** Approved elective

1. **Transport Processes**  
   - CHE 512 Separation Processes  
   - CHE 514 Fundamentals of Petroleum Production
2. ** Mathematical Analysis and Control**  
   - CH E 522 Advanced Process Control  
   - CH E 524 Process Control Laboratory
3. **Reaction Processes (not offered in 1990)**
4. **Polymer Science and Engineering**  
   - CH E 542 Polymerization and Polymer Properties  
   - *(2 course credits)*
5. **Extractive and Process Metallurgy**  
   - CH E 552 Extractive Metallurgy 1  
   - CH E 554 Extractive Metallurgy 2
6. **Industrial Biochemical Technology**  
   - CH E 562 Fermentation Engineering  
   - CH E 564 Food Process Engineering
7. **Pollution Control Engineering**  
   - CH E 572 Air Pollution Control  
   - CH E 574 Aqueous Inorganic Wastes
Civil Engineering

The complex problems and needs of current and future societies have created challenges for Engineering unparalleled in our history. To interpret and satisfy these needs, Civil Engineers currently direct the spending of more than one tenth of Canada's gross national product—more than any other professional group. The Civil Engineer must deal with the human impact of engineering—the social, moral and legal issues—to a far greater degree than ever before.

Historically, Civil Engineering is the oldest branch of engineering and goes back at least 5,000 years to the profession of "master builder" involving pyramids, temples and irrigation projects. Civil Engineering has become an extremely diverse field with opportunities for graduates in many areas of application. Furthermore, the introduction of new electronic data collection methods and the use of microcomputers has revolutionized the practice of Civil Engineering. Consequently, our curriculum is being constantly reviewed in order to produce graduate engineers who can use advanced aids to solve complex problems.

The Civil Engineering program is designed to provide the necessary fundamentals of mathematics and the natural sciences but also provides perspectives from the fields of the social sciences and humanities. The emphasis is on "problem-solving".

The Department of Civil Engineering at Waterloo is one of the largest in Canada; therefore, elective courses are available in each of the following areas.

Structural Engineering
Deals with the design and construction of all types of structures. Emphasis is placed on a broad foundation in mechanics and behaviour of materials.

Construction Engineering and Management
Courses in this area are intended for students interested in project management, construction materials and construction engineering.

Water and Waste Management Engineering
Addresses water and waste water treatment, surface and ground water control, solid and hazardous waste management, contaminant transport and behaviour in the environment. Support areas involving aquatic chemistry, computer modelling, simulation and laboratory experimentation as examples are also stressed.

Transportation Engineering
Deals with the planning, design, construction, traffic operation and evaluation of streets, highways, airports, and transit systems. Emphasis is placed on planning, design, operation and evaluation, particularly as related to demands.

Geotechnical Engineering
Familiarizes the student with the engineering properties of soils, the fundamentals of soil mechanics, and the application of geotechnical data and fundamentals to the design of foundation elements, earth-retaining structures, excavations, earth embankments and highway pavements.

Engineering Mechanics
For students with a strong interest in a rigorous study of mechanics, applied mathematics and related fields, leading to an understanding of advanced analysis and serving as a preparation for graduate study in structural engineering, hydraulics, mechanics of solids and fluids, or properties of materials.

Water Resources Engineering
Deals with the planning, management, design and operation of water supply and distribution systems, in flood control and flood hazard mapping, in the hydrologic and hydraulic aspects of environmental issues, and in the application of remotely-sensed data to hydrologic and environmental problems. See "Option in Water Resources" in the "Complementary Studies Requirements for Engineering Students" section, page 10:12.

Experimental Mechanics
Intended for students with an interest in experimental investigations of the static and dynamic response of structures and machines, and in the development of improved techniques to obtain and analyse experimental data.

Materials
Courses in this area are intended to provide the student interested in structural engineering, mechanics or properties of materials with a background in materials science.

Additional Areas of Study
Alternatively, the student can choose a more general pattern of study involving courses from several topic areas, or a program outside the traditional Civil Engineering field. For instance, with the approval of the Associate Chair for Undergraduate Studies, the student may augment Civil Engineering course programs with elective courses from:
- Public Administration
- Planning
- Management Science
- Business Administration
- Bioengineering
- Environmental Health, and others.

To this end, the Civil Engineering Curriculum has been designed to allow the maximum possible flexibility while still meeting the requirements for the professional degree.

The profession of Civil Engineering is principally involved with the creation, operation and maintenance of structures associated with water resources, transportation, power generation, and a wide range of industrial,
commercial and institutional buildings and complexes including whole urban structures. The activities include investigation, planning design, construction and evaluation.

Vocationally a Civil Engineer may specialize in one of the following areas: biomechanics, solid mechanics, fracture mechanics, elasticity, building structures, bridges, hydrology, hydraulics, sanitation (public health), industrial wastes, water resource structures, irrigation and drainage, inland waterways, harbours, aerospace, highways (roads and streets), railroads, pipelines, geology, meteorology, soil mechanics, foundations, tunnelling (rock mechanics), surveying and cartography, urban and regional planning and overall project planning. The list is by no means complete. For example, some of our graduates become involved in aquaculture. A Civil Engineering education may also be combined to advantage with another discipline or profession, such as Economics, Law, Medicine or Biology.

The Civil Engineer, regardless of whether he or she is a generalist or a specialist, draws heavily upon the work of the physical and social sciences, other professions and other branches of engineering. Moreover, as engineers have become involved in many interdisciplinary activities over the last decade, the job demarcation between boundaries of engineering has become much less restrictive. Certainly one of the advantages of completing a Civil Engineering program is that it allows professional registration while simultaneously providing a basis for further study and professional development in a large variety of specialized fields.

1. Core Program

a) Credit Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIV E 126</td>
<td>Civil Engineering Concepts</td>
</tr>
<tr>
<td>CIV E 203</td>
<td>Statics</td>
</tr>
<tr>
<td>CIV E 204</td>
<td>Mechanics of Solids 1</td>
</tr>
<tr>
<td>CIV E 205</td>
<td>Mechanics of Solids 2</td>
</tr>
<tr>
<td>CIV E 221</td>
<td>Calculus 2</td>
</tr>
<tr>
<td>CIV E 222</td>
<td>Differential Equations</td>
</tr>
<tr>
<td>CIV E 223A</td>
<td>Computer Workshop A</td>
</tr>
<tr>
<td>CIV E 223B</td>
<td>Computer Workshop B</td>
</tr>
<tr>
<td>CIV E 224</td>
<td>Probability and Statistics</td>
</tr>
<tr>
<td>CIV E 253</td>
<td>Geology for Engineers</td>
</tr>
<tr>
<td>CIV E 285</td>
<td>Structure and Properties of Materials</td>
</tr>
<tr>
<td>CIV E 280</td>
<td>Fluid Mechanics and Thermal Sciences</td>
</tr>
<tr>
<td>CIV E 291</td>
<td>Survey Camp</td>
</tr>
<tr>
<td>CIV E 292</td>
<td>Engineering Economics</td>
</tr>
<tr>
<td>CIV E 300</td>
<td>Civil Engineering Project 1</td>
</tr>
<tr>
<td>CIV E 303*</td>
<td>Structural Analysis 1</td>
</tr>
<tr>
<td>CIV E 342*</td>
<td>Transport Principles and Applications</td>
</tr>
<tr>
<td>CIV E 353*</td>
<td>Geotechnical Engineering 1</td>
</tr>
<tr>
<td>CIV E 375*</td>
<td>Water Quality Engineering</td>
</tr>
<tr>
<td>CIV E 400</td>
<td>Civil Engineering Project 2</td>
</tr>
<tr>
<td>CIV E 491</td>
<td>Engineering Law</td>
</tr>
</tbody>
</table>

Plus one of:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIV E 313</td>
<td>Structural Concrete Design 1</td>
</tr>
<tr>
<td>CIV E 413</td>
<td>Structural Steel Design</td>
</tr>
</tbody>
</table>

* Any one of these courses may be delayed to another term but must be taken before graduation and must be replaced by another technical course approved by the Associate Chair. (Delaying such a course may result in scheduling difficulties and may deny the student an opportunity to take an advanced course in that subject area later.)

b) Non-Credit Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIV E 298</td>
<td>Civil Engineering Seminars</td>
</tr>
<tr>
<td>CIV E 299</td>
<td>Civil Engineering Seminars</td>
</tr>
<tr>
<td>CIV E 398</td>
<td>Civil Engineering Seminars</td>
</tr>
<tr>
<td>CIV E 399</td>
<td>Civil Engineering Seminars</td>
</tr>
<tr>
<td>CIV E 498</td>
<td>Civil Engineering Seminars</td>
</tr>
<tr>
<td>CIV E 499</td>
<td>Civil Engineering Seminars</td>
</tr>
</tbody>
</table>

Civil Engineering Seminar

These seminars are designed to enrich the undergraduate program by providing guest lectures, informal lectures, mock trials and films relating to principles, methods and practice of Civil Engineering and the role of the engineer in society.

2. Electives

Each student is responsible for selecting his or her own program of electives, in keeping with the ultimate career objectives after graduation. The program must satisfy the requirements of the Department of Civil Engineering. This includes having to meet minimum requirements in:

- Mathematical Foundations
- Basic Sciences
- Engineering Sciences
- Engineering Design
- Complementary Studies

a) Technical Electives**

Elective courses may be selected from the following list, in accordance with the academic program for the term, and in consultation with the Faculty Advisor. A number of elective courses may be taken from the offerings of other departments including Wilfrid Laurier University.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIV E 306</td>
<td>Mechanics of Solids 3</td>
</tr>
<tr>
<td>CIV E 313</td>
<td>Structural Concrete Design 1</td>
</tr>
<tr>
<td>CIV E 343</td>
<td>Traffic Engineering</td>
</tr>
<tr>
<td>CIV E 344</td>
<td>Urban Transport Planning</td>
</tr>
<tr>
<td>CIV E 354</td>
<td>Geotechnical Engineering 2</td>
</tr>
<tr>
<td>CIV E 381</td>
<td>Hydraulics</td>
</tr>
<tr>
<td>CIV E 401</td>
<td>Civil Engineering Project 3</td>
</tr>
<tr>
<td>CIV E 403</td>
<td>Structural Analysis 2</td>
</tr>
<tr>
<td>CIV E 404</td>
<td>Structural Analysis 3</td>
</tr>
<tr>
<td>CIV E 405</td>
<td>Structural Dynamics</td>
</tr>
<tr>
<td>CIV E 407</td>
<td>Building Science &amp; Technology</td>
</tr>
<tr>
<td>CIV E 410</td>
<td>Structural Steel Design</td>
</tr>
<tr>
<td>CIV E 414</td>
<td>Structural Concrete Design 2</td>
</tr>
<tr>
<td>CIV E 415</td>
<td>Structural Systems</td>
</tr>
<tr>
<td>CIV E 422</td>
<td>Finite Element Analysis</td>
</tr>
<tr>
<td>CIV E 430</td>
<td>Experimental Mechanics</td>
</tr>
<tr>
<td>CIV E 440</td>
<td>Transport Systems Analysis</td>
</tr>
<tr>
<td>CIV E 442</td>
<td>Pavement Structural Design</td>
</tr>
<tr>
<td>CIV E 454</td>
<td>Geotechnical Engineering 3</td>
</tr>
<tr>
<td>CIV E 460</td>
<td>Orthopaedic-Bioengineering</td>
</tr>
<tr>
<td>CIV E 472</td>
<td>Waste Water Treatment</td>
</tr>
</tbody>
</table>

** Any elective course may result in scheduling difficulties and may deny the student an opportunity to take another course in that subject area later.
CIV E 473  Contaminant Transport
CIV E 480  Water Resources Management
CIV E 483  Design of Urban Water Systems
CIV E 486  Hydrology
CIV E 493  Engineering in the Canadian North
CIV E 496  Construction Engineering

** With the exception of CIV E 313 and CIV E 413, the offering of these courses is contingent upon sufficient demand and/or available teaching resources.

b) Complementary Studies Electives
Five courses in non-technical subjects, including the Complementary Studies elective in the 1B term, must be taken. The marks obtained in these courses will be included in the calculation of term averages. These courses are organized on a Faculty basis and detailed in this Calendar under the section Complementary Studies in the Faculty of Engineering.

3. Academic Program for Each Term

Term 1A Fall
MATH 114, MATH 116 (formerly MATH 110A), CH E 102, PHYS 115, GEN E 165, GEN E 170

Term 1B (Winter and Spring)
MATH 118 (formerly MATH 110B), PHYS 125, GEN E 121, GEN E 123, CIV E 126, one Complementary Studies elective.

Term 2A (Fall and Winter)
CIV E 203, CIV E 204, CIV E 221, CIV E 223A, CIV E 224, CIV E 265, CIV E 292, CIV E 298, CIV E 291+

Term 2B (Spring and Fall)
CIV E 205, CIV E 222, CIV E 223B, CIV E 253, CIV E 280, CIV E 299; one Complementary Studies elective, CIV E 291+

Term 3A (Winter and Spring)
Any one of the courses marked with * may be delayed to another term but must be taken before graduation and must be replaced by another technical course approved by the Associate Chair. (Delaying such a course may result in scheduling difficulties and may deny the student an opportunity to take an advanced course in that subject area later.)

Term 3B (Fall and Winter)
CIV E 399; four technical electives; one Complementary Studies elective. At least one of CIV E 313 and CIV E 413 must be taken before graduation.

Term 4A (Spring and Fall)
CIV E 400, CIV E 498; four technical electives. At least one of CIV E 313 and CIV E 413 must be taken before graduation.

Term 4B (Winter)
CIV E 491, CIV E 499; four technical electives. A total of ten courses are required in 4A and 4B.

+ CIV E 291 Survey Camp is taken at the commencement of the Fall term, preceding either 2A or 2B.

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Engineering
Civil Engineering
Computer Engineering

Faculty Options
Complete details of designated options available to engineering students are provided in this Calendar in the Engineering section entitled “Complementary Studies Requirements, Options and Electives”. Students who satisfy the option requirements will have the appropriate designation shown on their transcript. The following two options are of primary interest to Civil Engineering students. (Note: To qualify for these options, the student must achieve a grade of at least 50% in each course and must obtain a cumulative average of 60% or more in these courses.)

Civil Engineering with an Option in Water Resources
This is a designated Engineering Faculty Option available to Civil Engineering students interested in the development, management and protection of our water resources. Students may choose from the water and waste management elective courses or the water resources engineering elective courses as well as from a list of approved courses from other departments. Students who complete the option will have both a Water Resources and a Civil Engineering designation on their transcript. The option is described earlier in this chapter within the “Complementary Studies Requirements for Engineering Students” section, page 10:12.

Civil Engineering With an Option in Management Science
This option provides an understanding of the issues, concepts and techniques related to the management of technology. The option consists of a sequence of seven courses. A student who wishes to follow the Management Sciences Option must declare his or her intent before starting the 2B term. For further details see the “Engineering Management Sciences” section, page 10:28.

Combined Bachelor's - Master's Program In Engineering
The Faculty of Engineering offers a combined Bachelor's - Master's Program. See “Engineering Combined Bachelor's - Master's Program”, page 10:14, for more details.

Computer Engineering
The Computer Engineering program is controlled and administered by the Department of Electrical and Computer Engineering.

Computer Engineering is a branch of engineering that deals with the design, development and application of computer systems and emphasizes such factors as functions, performance, cost, size, power requirements, reliability, maintainability and societal impact. Intrinsic to computer engineering is the concept of design as it applies to all aspects of a computer system (the hardware, the software and the algorithms used) and the application for which it is intended. As with engineers in other disciplines, the goal of computer engineers is implementation, here to build a computer system for an application environment.
The curriculum in Computer Engineering encompasses the study of mathematics, physics and basic electrical engineering and computer science disciplines. This study is complemented by a thorough education in computer hardware and software.

After the Year One program in Engineering, the program in Computer Engineering consists of prescribed core courses in Years Two and Three. In Year Four, the student takes eight technical courses, seven of which are elective. These include the possibility of a design or research project.

In addition, students must satisfy Faculty of Engineering complementary studies requirements by choosing five suitable elective courses.

The normal recommended program shown below involves a course load (excluding seminars) of five courses (except six in 1B) per term. Laboratory exercises are compulsory where they form part of a course. Departmental permission at the time of registration will be required for departures from the normal load in any one term. The normal rules of the Co-operative program will apply. By special permission the number of Co-operative work terms may be reduced, but a student must complete at least five work terms (including that done in Year One), unless admitted to advanced standing, as defined in the Calendar (see page 10:3).

Permission to carry more than the normal load in any one term normally will be given only if the student holds an 80% average or better in the previous term.

The promotion criteria will be as laid down in the Faculty rules (see page 10:3).

Complementary Studies Electives
Five courses must be chosen to satisfy the Complementary Studies Program described on page 10:7.

AVAILABLE OPTIONS
The normal Computer Engineering program shown has been designed to offer a well balanced and rewarding education. Students wishing to enrich their education further may elect to take one of the three Options available. These Options are described below. Students should be aware that an Option may require additional courses, and may constrain the choice of elective courses. An 80% average is required to enter the Mathematics or Physics Option.

Management Sciences Option
This is a sequence of seven courses (see page 10:12) designed for those students with an interest in the management of technology. Further details are made available from the department.

The successful completion of these courses results in a designation on the transcript "Option in Management Sciences".

Mathematics Option
This is a sequence of eight courses (see page 10:11) designed to give students a broad background in either pure or applied mathematics. Further details are made available from the department.

The successful completion of these courses results in a designation on the transcript "Option in Mathematics".

Physics Option
This is a sequence of eight courses (see page 10:11) designed to give students an enriched background in the fundamentals of physical science. Further details are made available from the department.

The successful completion of these courses results in a designation on the transcript "Option in Physics".

ACADEMIC PROGRAM 1991-92

Note
The laboratory hours are approximate indications of the average time the student will spend in the laboratory.

The 1A term is as described on page 10:16.

<table>
<thead>
<tr>
<th>Term 1B, Winter</th>
<th>C</th>
<th>T</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 118 Calculus 1B</td>
<td>3</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>GEN E 121 Digital Computation</td>
<td>3</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>E&amp;CE 123 Electrical Engineering Circuits</td>
<td>3</td>
<td>1</td>
<td>3*</td>
</tr>
<tr>
<td>E&amp;CE 126 Electricity &amp; Magnetism</td>
<td>3</td>
<td>1</td>
<td>3*</td>
</tr>
<tr>
<td>PHYS 125 Physics for Engineers</td>
<td>3</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>M SCI 261 Managerial and Engineering Economics 1</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Term 2A, Fall</th>
<th>C</th>
<th>T</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>E&amp;CE 201 Seminar</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>MATH 211 Advanced Calculus for (E&amp;CE 205) Electrical Engineers 1</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>E&amp;CE 208 Electronic Circuit Analysis</td>
<td>3</td>
<td>1</td>
<td>3*</td>
</tr>
<tr>
<td>E&amp;CE 222 Digital Computers</td>
<td>3</td>
<td>1</td>
<td>3*</td>
</tr>
<tr>
<td>E&amp;CE 251 Programming Languages &amp; Translators</td>
<td>3</td>
<td>1</td>
<td>3*</td>
</tr>
<tr>
<td>Complementary Studies Elective</td>
<td>3</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Term 2B, Spring</th>
<th>C</th>
<th>T</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>E&amp;CE 202 Seminar</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>MATH 212 Advanced Calculus for (E&amp;CE 206) Electrical Engineers 2</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>E&amp;CE 223 Digital Circuits &amp; Systems</td>
<td>3</td>
<td>1</td>
<td>3*</td>
</tr>
<tr>
<td>E&amp;CE 252 Data Structures</td>
<td>3</td>
<td>1</td>
<td>3*</td>
</tr>
<tr>
<td>E&amp;CE 260 Electromagnetic Devices</td>
<td>3</td>
<td>1</td>
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<tr>
<td>Complementary Studies Elective</td>
<td>3</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
### Electrical Engineering

The Electrical Engineering program is controlled and administered by the Department of Electrical and Computer Engineering. Students are divided into two streams, 8 and 4. The 8 stream has a continuous first year, with the first work term in Spring, while the 4 stream has a work term in Winter, between 1A and 1B.

The curriculum in Electrical Engineering is designed to teach those fundamental physical and engineering sciences which form the basis of the work of electrical engineers. After the Year One program in Engineering, the program in Electrical Engineering consists of prescribed core courses and eight technical electives (taken during the last two terms). These technical electives include the possibility of a design or research project. In addition, students must satisfy Faculty of Engineering complementary studies requirements by choosing suitable elective courses.

The normal recommended program shown below involves a course load (excluding seminars) of five courses per term (except six in 1B). Laboratory exercises are compulsory where they form part of a course. Departmental permission will be required for departures from the normal load in any one term.

The normal rules of the Co-operative program will apply. By special permission the number of Co-operative work terms may be reduced, but a student must complete at least five work terms (including that done in Year One), unless admitted to advanced standing, as defined in the Calendar (see page 10:3).

Permission to carry more than the normal load in any one term will normally be given only if the student holds an 80% average or better in the previous term. The promotion criteria will be as laid down in the Faculty rules (see page 10:3).
AVAILABLE OPTIONS
The normal Electrical Engineering program shown has been designed to offer a well balanced and rewarding education. Students wishing to enrich their education further may elect to take one of the four Options available. These Options are described below. Students should be aware that an Option may require additional courses, and may constrain the choice of elective courses. An 80% average is required to enter the Computer Engineering, Mathematics or Physics Options.

Computer Engineering Option
This is a sequence of eight courses designed to give Electrical Engineering students a greater training in software to augment their digital hardware capabilities. Two courses are part of the regular program. The other courses and the terms in which they are taken are:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Term</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 241</td>
<td>Principles of Computer Science</td>
<td>2B</td>
<td>3</td>
</tr>
<tr>
<td>CS 242</td>
<td>Principles of Computer Science</td>
<td>3A</td>
<td>4</td>
</tr>
<tr>
<td>CS 340</td>
<td>Data Structures</td>
<td>3B</td>
<td>3</td>
</tr>
<tr>
<td>E&amp;CE 427</td>
<td>Digital Systems Engineering</td>
<td>4B</td>
<td>4</td>
</tr>
</tbody>
</table>

In addition to these courses, two other computer science courses, chosen from a list, will be taken in the fourth year. Further details are made available from the Department.

The successful completion of these courses results in a designation on the transcript “Option in Computer Engineering”.

Management Sciences Option
This is a sequence of seven courses (see page 1012) designed for those students with an interest in the management of technology. Further details are made available from the Department.

The successful completion of these courses results in a designation on the transcript “Option in Management Sciences”.

Mathematics Option
This is a sequence of eight courses (see page 1011) designed to give students a broad background in either pure or applied mathematics. Further details are made available from the Department.

The successful completion of these courses results in a designation on the transcript “Option in Mathematics”.

Physics Option
This is a sequence of eight courses (see page 1011) designed to give students an enriched background in the fundamentals of physical science. Further details are made available from the Department.

The successful completion of these courses results in a designation on the transcript “Option in Physics”.

ACADEMIC PROGRAM 1991/92

Notes
1. With the approval of the department in terms 4A and 4B, students may take technical courses offered by other departments.
2. The laboratory hours shown are approximate indications of the average time the student will spend in the laboratory.

The 1A term is as described on page 1016.

<table>
<thead>
<tr>
<th>Term 1B (8 Winter, 4 Spring)</th>
<th>C</th>
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<tbody>
<tr>
<td>MATH 118</td>
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<td>PHYS 125</td>
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<tr>
<td>E&amp;CE 126</td>
<td>Electricity &amp; Magnetism</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>M SCI 261</td>
<td>Managerial and Engineering Economics</td>
<td>3</td>
<td>1</td>
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<table>
<thead>
<tr>
<th>Term 2A (8 Fall, 4 Winter)</th>
<th>C</th>
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<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>E&amp;CE 201</td>
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<td>Electronic Circuit Analysis</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>E&amp;CE 222</td>
<td>Digital Computers</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>E&amp;CE 261</td>
<td>Energy Systems &amp; Components 1</td>
<td>3</td>
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<table>
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<tr>
<th>Term 2B (8 Spring, 4 Fall)</th>
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<tr>
<td>E&amp;CE 202</td>
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<tr>
<td>MATH 212</td>
<td>Advanced Calculus for Electrical Engineers 2</td>
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<tr>
<td>E&amp;CE 223</td>
<td>Digital Circuits &amp; Systems</td>
<td>3</td>
<td>1</td>
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<tr>
<td>E&amp;CE 231</td>
<td>Electronic Devices</td>
<td>3</td>
<td>1</td>
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<tr>
<td>E&amp;CE 262</td>
<td>Energy Systems &amp; Components 2</td>
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<table>
<thead>
<tr>
<th>Term 3A (8 Winter, 4 Spring)</th>
<th>C</th>
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<tbody>
<tr>
<td>E&amp;CE 301</td>
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<tr>
<td>E&amp;CE 316</td>
<td>Introduction to Probability Theory</td>
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<tr>
<td>E&amp;CE 332</td>
<td>Electronic Circuits</td>
<td>3</td>
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<tr>
<td>E&amp;CE 342</td>
<td>Electrical Networks 1</td>
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<tr>
<td>E&amp;CE 371</td>
<td>Transmission Lines &amp; Basic Field Theory</td>
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### Term 3B (8 Fall, 4 Winter)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>E&amp;CE 302</td>
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<tr>
<td>ME 250</td>
<td>Thermodynamics</td>
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<td>1</td>
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<tr>
<td>E&amp;CE 304</td>
<td>Numerical Methods</td>
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<td>1</td>
<td></td>
</tr>
<tr>
<td>E&amp;CE 318</td>
<td>Communication Systems</td>
<td>3</td>
<td>1</td>
<td>3*</td>
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<tr>
<td>E&amp;CE 380</td>
<td>Systems &amp; Control</td>
<td>3</td>
<td>1</td>
<td>3*</td>
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<tr>
<td>Complementary Studies Elective</td>
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Four Technical Electives from the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>E&amp;CE 381</td>
<td>Design of Analog and Engineering</td>
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</tr>
<tr>
<td>E&amp;CE 402</td>
<td>Seminar</td>
<td></td>
</tr>
<tr>
<td>E&amp;CE 411</td>
<td>Digital Communications Networks</td>
<td></td>
</tr>
<tr>
<td>E&amp;CE 428</td>
<td>Computer Communications</td>
<td></td>
</tr>
<tr>
<td>E&amp;CE 435</td>
<td>Semiconductor Devices</td>
<td></td>
</tr>
<tr>
<td>E&amp;CE 438</td>
<td>Switching and Digital Circuits</td>
<td></td>
</tr>
<tr>
<td>E&amp;CE 446</td>
<td>Linear Systems</td>
<td></td>
</tr>
<tr>
<td>E&amp;CE 450</td>
<td>Software Systems</td>
<td></td>
</tr>
<tr>
<td>E&amp;CE 464</td>
<td>Insulation and High Voltage</td>
<td></td>
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<tr>
<td>E&amp;CE 474</td>
<td>Antenna Engineering</td>
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<tr>
<td>E&amp;CE 481</td>
<td>Design of Analog and Engineering</td>
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<tr>
<td>E&amp;CE 499A</td>
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Term 4A (8 Spring, 4 Fall)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>E&amp;CE 382</td>
<td>Seminar</td>
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<td>Complementary Studies Elective</td>
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Four Technical Electives from the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
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<tbody>
<tr>
<td>E&amp;CE 381</td>
<td>Design of Analog and Engineering</td>
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</tr>
<tr>
<td>E&amp;CE 402</td>
<td>Seminar</td>
<td></td>
</tr>
<tr>
<td>E&amp;CE 411</td>
<td>Digital Communications Networks</td>
<td></td>
</tr>
<tr>
<td>E&amp;CE 428</td>
<td>Computer Communications</td>
<td></td>
</tr>
<tr>
<td>E&amp;CE 435</td>
<td>Semiconductor Devices</td>
<td></td>
</tr>
<tr>
<td>E&amp;CE 438</td>
<td>Switching and Digital Circuits</td>
<td></td>
</tr>
<tr>
<td>E&amp;CE 446</td>
<td>Linear Systems</td>
<td></td>
</tr>
<tr>
<td>E&amp;CE 450</td>
<td>Software Systems</td>
<td></td>
</tr>
<tr>
<td>E&amp;CE 464</td>
<td>Insulation and High Voltage</td>
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</tr>
<tr>
<td>E&amp;CE 474</td>
<td>Antenna Engineering</td>
<td></td>
</tr>
<tr>
<td>E&amp;CE 481</td>
<td>Design of Analog and Engineering</td>
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</tr>
<tr>
<td>E&amp;CE 499A</td>
<td>Project</td>
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Term 4B, Winter (Both streams)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>E&amp;CE 402</td>
<td>Seminar</td>
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Free Elective

Four Technical Electives from the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>E&amp;CE 408</td>
<td>Robot Dynamics and Control</td>
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<tr>
<td>E&amp;CE 412</td>
<td>Data Communications</td>
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<tr>
<td>E&amp;CE 413</td>
<td>Digital Signal Processing</td>
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<tr>
<td>E&amp;CE 427</td>
<td>Digital Systems Engineering</td>
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</tr>
<tr>
<td>E&amp;CE 429</td>
<td>Computer Structures</td>
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</tr>
<tr>
<td>E&amp;CE 436</td>
<td>Design of Integrated Circuits &amp; Devices</td>
<td></td>
</tr>
<tr>
<td>E&amp;CE 437</td>
<td>Integrated VLSI Systems</td>
<td></td>
</tr>
<tr>
<td>E&amp;CE 439</td>
<td>Analog Electronic Circuits</td>
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</tr>
<tr>
<td>E&amp;CE 443</td>
<td>Electrical Networks 2</td>
<td></td>
</tr>
<tr>
<td>E&amp;CE 456</td>
<td>Database Systems</td>
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</tr>
<tr>
<td>E&amp;CE 463</td>
<td>Power Electronics</td>
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</tr>
<tr>
<td>E&amp;CE 465</td>
<td>Power Systems</td>
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</tr>
<tr>
<td>E&amp;CE 473</td>
<td>Microwave Engineering</td>
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</tr>
<tr>
<td>E&amp;CE 475</td>
<td>Guided Wave Engineering</td>
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<tr>
<td>E&amp;CE 482</td>
<td>Multivariable Control Systems</td>
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</tr>
<tr>
<td>E&amp;CE 485</td>
<td>Computer Control Applications</td>
<td></td>
</tr>
<tr>
<td>E&amp;CE 499B</td>
<td>Project</td>
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</tr>
</tbody>
</table>

Geological Engineering

Geological Engineering is an interdisciplinary program involving the Faculties of Engineering and Science and, in particular, the Departments of Civil Engineering and Earth Sciences. The program is administered by the Geological Engineering Board which consists of faculty from both departments.

Geological Engineers study the origins and properties of earth materials, and learn how to predict the behaviour of these materials. This information is used to design structures in or on soil and rock, design mineral extraction processes in mining and petroleum engineering, explore for and protect groundwater sources, plan and design transportation routes, and so on.

Employment opportunities for Geological Engineers are available in the areas of petroleum geology and engineering, mining geology and mine design, building construction, water supply, geophysics, surveying, highway and airport construction, hydrology, coastal engineering and granular materials supply. Geological Engineering graduates with strength in the geotechnical area find their employment activities most closely associated with public works such as site investigation and design studies for tunnels, roads, railroads, air-strips, shorelines, ports, underground storage, and waste disposal facilities. An increasing amount of activity lies in groundwater studies and environmental impact studies, including hydrologic and geotechnical investigations associated with mining development, geomechanical aspects of petroleum recovery, both conventional and unconventional such as tar sands development and in-situ heavy oil extraction.

The demand for the expertise offered by geological engineers is expanding into many of the resource-development areas that will probably continue to play a major role in the Canadian economy for many decades. Also, the geological engineer is in increasing demand for works of a civil nature, such as tunnels, dams, landfills, and aspects of environmental engineering.
ACADEMIC PROGRAM

**Term 2A, Fall**
- EARTH 231 Mineralogy
- EARTH 235 Stratigraphy
- EARTH 260 Applied Geophysics 1
- CIV E 203 Statics
- CIV E 204 Mechanics of Solids 1
- CIV E 221 Calculus 2
- CIV E 291 Survey Camp
- GEO E 298 Class Prof. Hour

**Term 2B, Spring**
- CIV E 222 Differential Equations
- CIV E 280 Fluid Mechanics
- EARTH 221 Geochemistry 1
- EARTH 232 Petrography
- EARTH 238 Intro. Structural Geology
- GEO E 299 Class Prof. Hour
- Complementary Studies Elective

**Term 3A, Winter**
- CIV E 300 Civil Engineering Project 1
- CIV E 353 Geotechnical Engineering 1
- CIV E 375 Water Quality Engineering
- EARTH 333 Introductory Sedimentology
- EARTH 390 Methods in Geological Mapping
- EARTH 438 Engineering Geology
- GEO E 398 Class Prof. Hour
- Complementary Studies Elective

**Term 3B, Fall**
- EARTH 437 Rock Mechanics
- CIV E 224 Probability and Statistics
- CIV E 292 Engineering Economics
- CIV E 354 Geotechnical Engineering 2
- GEO E 399 Class Prof. Hour
- Complementary Studies Elective
- One technical elective from:
  - EARTH 331 Igneous Petrology
  - EARTH 342 Applied Geomorphology
  - CIV E 381 Hydraulics

**Term 4A, Fall**
- EARTH 456 Numerical Meth. in Geoscience
- EARTH 458 Physical Hydrogeology
- EARTH 490 Field Trip
- GEO E 400 Geological Engineering Thesis 1
- GEO E 498 Class Prof. Hour
- Complementary Studies Elective
- Two technical electives from:
  - EARTH 421 Geochemistry 2
  - EARTH 440 Quaternary Geology
  - EARTH 470 Metallic Mineral Deposits
  - CIV E 472 Wastewater Treatment
  - CIV E 486 Hydrology

**Term 4B, Winter**
- CIV E 491 Engineering Law
- GEO E 401 Geological Engineering Thesis 2
- GEO E 499 Class Prof. Hour
- Complementary Studies Elective

**Engineering**

**Geological Engineering**

**Management Sciences**

Two technical electives from:
- EARTH 427 Crustal Evolution
- EARTH 433 Applied Sedimentology
- EARTH 435 Advanced Structural Geology
- EARTH 459 Chemical Hydrogeology
- EARTH 469 Applied Geophysics 2
- CIV E 422 Finite Element Analysis
- CIV E 454 Geotechnical Engineering 3
- CIV E 473 Contaminant Transport
- CIV E 480 Water Resources Management
- CIV E 493 Engineering in the Canadian North
- CH E 514 Fundamentals of Petroleum Production
- CH E 552 Extractive Metallurgy

**Notes**

1. The availability of some elective courses is contingent upon sufficient demand, scheduling constraints, and teaching resources.
2. Each proposed program of studies should be reviewed by a Faculty advisor to ensure that it (1) satisfies prescribed minimum requirements with respect to Mathematics, Science, Engineering Science, Engineering Design and Complementary Studies, and (2) satisfies prerequisite requirements.
3. Each approved program of studies must include at least three EARTH technical electives and at least two CIV E technical electives from 3B on.
4. It is recommended that EARTH 342 or EARTH 440 be taken before graduation.

**Management Sciences**

The Department of Management Sciences, Faculty of Engineering, was established in 1969 as a graduate department and has subsequently extended its activities to undergraduate programs. The management sciences are concerned with the application of scientific methods in the resolution of complex problems facing management of both private and public sector organizations.

The present activities of the department are:

1. the pursuit of advanced research in selected fields of the management sciences;
2. the provision of post-graduate courses of instruction, including part-time studies in Mississauga, for people who want to achieve high professional qualifications; and
3. the provision of undergraduate courses in the management sciences for students registered in the Faculties of Engineering and Mathematics.

Active faculty engagement in advanced research, as well as experience in professional practice, is considered essential to the development of adequate courses of instruction. The research activities of the faculty members include operations research, manufacturing systems and organizational behaviour.
The Option in Management Sciences

Arrangements have been made, in terms of scheduling flexibilities (providing adequate positions for electives), for any student in the following departments to complete an Option in Management Sciences:

Chemical Engineering
Civil Engineering
Computer Engineering
Electrical Engineering
Mechanical Engineering
Systems Design Engineering

The Option in Management Sciences is structured to provide an understanding of the issues, concepts, and techniques related to managerial problems, particularly those concerned with the management of technology. Students acquire skills which should help widen the scope of their immediate employment. Those taking the Option may advance to the MASc in Management Sciences within three academic terms following the completion of the BASc.

The option consists of seven courses (see course descriptions in Chapter 16). F - fall, W - winter, S - spring

Four required courses or their equivalents

* M SCI 251 Probability and Statistics (F,W) equivalents CH E 022, CIV E 224, E&CE 316, ME 202, SY DE 213
M SCI 261 Managerial and Engineering Economics I (F,W,S) equivalents CH E 044, CIV E 292, SY DE 131 (correspondence F,W)
+* M SCI 211 Organizational Behaviour (F,W,S) (correspondence F,W)
*M SCI 331 Operations Research I (F,W,S) equivalent SY DE 311

Plus three of the following or equivalents

M SCI 452 Decision Making Under Uncertainty (W) equivalent SY DE 214
+* M SCI 461 Managerial and Engineering Economics II (S,F)
*M SCI 431 Operations Research II (W) equivalent SY DE 411
*M SCI 432 Introduction to Production (F,W,S) equivalent M E 446
+ M SCI 311 Organizational Behaviour II (F,W) (correspondence F,W)
+ M SCI 441 Management of Information Systems (W)

* These courses can be counted as part of the Complementary Studies requirements.

* For students wishing to take a Masters of Business Administration at Wilfrid Laurier University these courses should be taken for advanced credit toward the MBA.

For the designation "Option in Management Sciences" to be shown on the transcript the student must achieve 50% in each course taken in the Option and an overall cumulative average of 60% in these courses.

Mechanical Engineering

The scope of Mechanical Engineering is so wide and its services so universally needed as a basic part of all kinds of engineering work that the mechanical engineer is in demand in industries throughout Canada. Mechanical Engineers are required in the field of power generation, where they deal with steam, diesel or other internal combustion engines, and with hydraulic or gas turbines; in the field of heating, ventilation and refrigeration; in the design, analysis, and production of machines and equipment, for example, safety equipment, material handling equipment, automobiles, locomotives, marine vessels, furnaces, boilers, pressure vessels, heat exchangers, motors, generators and machine tools. They are employed in industries whose function is concerned with manufacturing, steel production, mining, transportation, communications, oil refining, chemical manufacture, paper, sugar, textiles, aerospace, nuclear energy, natural gas production and transmission and construction. In the last few years, because of the need to develop alternative energy sources, Mechanical Engineers have taken a major role in the development of new methods of energy conversion. The undergraduate program in Mechanical Engineering is designed to provide the student with a firm grasp of the fundamentals of mathematics, physics and engineering as well as to provide some opportunity for specialization in the later years. The degree of BASc in Mechanical Engineering is accredited and permits registration as a Professional Engineer in the Association of Professional Engineers in almost any Canadian Province upon satisfaction of the work experience requirement and upon passing the Association exams in law and ethics.

The Mechanical Engineering undergraduate program contains a core of basic subjects that must be taken by all students. The first year is virtually common with Civil and Electrical Engineering. The second and third years provide courses in Mechanical Engineering and Electrical Engineering with further development in mathematics and physics. Opportunities for specialization exist during the fourth year, where a choice of elective courses arranged into different option areas is available. Non-technical (complementary studies) courses are distributed throughout the program and do not appear in all years.

Each student is responsible for selecting his or her own program of electives, in keeping with the ultimate career objective after graduation. Each term, certain faculty members are designated to give advice to students and to approve their selection. It is anticipated, and indeed encouraged, that individual students should take a majority of their technical electives from one of the option areas. The Options are:

Fluid Mechanics and Thermodynamics Option

The courses in this Option deal with a broad range of applications of the principles of thermodynamics and fluid mechanics, with emphasis on topics of industrial significance, for example, combustion, energy conversion,
internal flows with heat and mass transfer, turbomachinery, and external flows such as plumes in air and effluents in water.

Environmental (Geophysical) Fluid Dynamics Option
This Option is closely linked with the above Option and involves application of the principles of fluid mechanics and thermodynamics to problems in the natural environment. It is intended for students interested in careers in air and water pollution control, oceanography, and related fields.

Machine Design and Solid Mechanics Option
The courses offered in this Option range from those which provide the mathematical and physical basis of the subject matter through to those which are largely applied in nature. Subjects treated are: mechanics (including vibrations); theories of elasticity, plasticity and fracture; machine design and design optimization.

Engineerings Materials Option
This Option consists of a comprehensive series of courses in metallurgy, including heat treatment, casting, welding, cold and hot forming. Nonmetallic materials, including plastics and ceramics. Composites, such as fiberglass and sandwich structures are also considered.

Production and Automation Option
The courses in this Option are designed to provide the student with an understanding of the principles and control of production processes, the application of computers to the manufacturing activity and the organization of production. Topics treated are: automation, metal forming, numerical control of machine tools, applications of fluid power and industrial noise control.

Mechanical Engineering Core with an Option in Management Sciences
A student may acquire a BASc in Mechanical Engineering with an Option in Management Sciences by taking, completing and passing seven specific Management Science courses as electives (see elective course listing under Department of Management Sciences). Students interested in this option must carefully plan their choice of complementary studies courses very early in order to ensure that the complementary studies requirements will be met. (See note below under elective courses).

1. Core Program
   a) Credit Courses
   M E 201 Advanced Calculus
   M E 203 Ordinary Differential Equations
   M E 212 Dynamics
   M E 215 Structure and Properties of Materials
   M E 219 Mechanics of Deformable Solids 1
   M E 220 Mechanics of Deformable Solids 2
   M E 250 Thermodynamics 1
   M E 262 Introduction to Microprocessors and Digital Logic
   M E 304 Numerical Analysis
   M E 305 Partial Differential Equations
   M E 321 Kinematics and Dynamics of Machines
   M E 322 Mechanical Design 1
   M E 330 Control of Properties of Materials
   M E 340 Manufacturing Processes
   M E 351 Fluid Mechanics 1
   M E 353 Heat Transfer 1
   M E 354 Thermodynamics 2
   M E 360 Introduction to Control Systems
   M E 362 Fluid Mechanics 2
   M E 202 Probability and Statistics (Equivalent to M SCI 251)
   M SCI 261 Managerial and Engineering Economics 1
   E & CE 269 Electrical Engineering 2

   b) Non Credit Courses
   M E 200A/200B Seminar
   M E 300A/300B Seminar
   M E 400A/400B Seminar

2. Elective Courses
   a) Complementary Studies Electives
   Students entering the program will take five Complementary Studies electives in total in non-technical subjects. The marks obtained in these courses will be included in the calculation of term averages. These courses are organized on a faculty basis and detailed in this Calendar under the section Complementary Studies in the Faculty of Engineering.

   b) Technical Electives
   Nine technical elective courses are required in addition to the core courses listed above to fulfill the requirements of the Mechanical Engineering program. In the final year, a project course, ME 482, normally a two-term project course, may be taken as a technical elective in each of the 4A and 4B terms. The project requires the student to demonstrate initiative and assume responsibility. Each student is responsible for selecting their program of electives, and project.

   During the term, certain faculty members are designated to give advice to students and to approve their final selection by signing their PRE-REGISTRATION form. A student who has an unusual career goal in mind should discuss choices with one of the designated faculty members, since it is possible to combine courses from different Options, to take courses from other departments and in some circumstances take graduate-level courses. Students who are contemplating graduate study are particularly urged to discuss their plans with the designated faculty member. The designated faculty member must be convinced of the validity of the student's selection of electives. If the faculty member refuses to sign the pre-registration form the student must reconsider his or her selection or must discuss the choices with the Associate Chair for Undergraduate Studies.

As a guide, typical lists of electives for the six Option areas available from within the Department of Mechanical Engineering are given below:
i) Fluid Mechanics and Thermodynamics Option:
     M E 452 Energy Transfer in Buildings
     M E 456 Heat Transfer 2
     M E 459 Energy Conversion
     M E 463 Tribology 1
     M E 557 Combustion 1
     M E 559 Finite Element Methods
     M E 563 Turbomachines
     M E 564 Aerodynamics
     M E 565 Gas Dynamics
     M E 566 Fluid Mechanics 3
     M E 568 Noise Analysis and Control
     M E 569 Fluid Mechanics -- Design Topics

ii) Environmental Fluid Mechanics Option:
     M E 469 Dynamics of the Atmospheric Boundary Layer
     M E 559 Finite Element Methods
     M E 566 Fluid Mechanics 3
     M E 568 Noise Analysis and Control
     M E 571 Air Pollution 1

iii) Machine Design and Solid Mechanics Option
     M E 423 Mechanical Design 2
     M E 435 Industrial Metallurgy
     M E 463 Tribology 1
     M E 524 Advanced Dynamics
     M E 525 Mechanical Vibrations in Machines
     M E 527 Mechanics of Deformable Solids 3
     M E 544 Welding
     M E 559 Finite Element Methods
     M E 568 Noise Analysis and Control
     M E 626 Fatigue and Fracture Analysis (See Graduate Calendar)

iv) Engineering Materials Option
     M E 432 Physical Metallurgy of Deformation and Fracture
     M E 435 Industrial Metallurgy
     M E 527 Mechanics of Deformable Solids 3
     M E 531 Physical Metallurgy of Structures and Transformations

v) Production and Automation Option
     M E 435 Industrial Metallurgy
     M E 447 Advanced Manufacturing Technologies
     M E 448 Production Engineering and Design of Manufacturing Systems
     M E 463 Tribology 1
     M E 541 Deformation Processes
     M E 542 Machine Tool Analysis
     M E 543 Metal Casting Processes
     M E 544 Welding
     M E 548 Numerical Control of Machine Tools 1
     M E 559 Finite Element Methods
     M E 561 Fluid Power Control Systems
     M E 568 Noise Analysis and Control

vi) Mechanical Engineering Core with Option in Management Sciences
     The Management Sciences Option consists of the following courses in Management Sciences in addition to the core Mechanical Engineering program. For further details see the Department of Management Sciences.
     1A (F) none
     1B (W,S) none
     2A (F,W) M SCI 251†, M SCI 211†
     2B (SF) M SCI 261†
     3A (W,S) none
     3B (F) none
     4A/4B M SCI 331 plus three of the following or equivalents: M SCI 311†, M SCI 431, M SCI 432 (or M E 448), M SCI 451, M SCI 451†, M SCI 441†.*

* Complementary Studies course.
† course is part of existing Mechanical Engineering core program

The Mechanical Engineering curriculum structure is summarized in the following table:

<table>
<thead>
<tr>
<th>Term</th>
<th>Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A (F)</td>
<td>CH E 102</td>
</tr>
<tr>
<td>1B (W,S)</td>
<td>GEN E 121</td>
</tr>
<tr>
<td>2A (F,W)</td>
<td>M E 200A</td>
</tr>
<tr>
<td>4A (S,F)</td>
<td>M E 400A</td>
</tr>
<tr>
<td>4B (W)</td>
<td>M E 400B</td>
</tr>
</tbody>
</table>

†A project course, M E 482, may be taken in the 4A and 4B terms as a technical elective for each of these terms.
Systems Design Engineering

Effective solutions to problems involving both society and technology must be based on a broad systems point-of-view. Not only must the overall technical factors of these problems be carefully considered, but the economic, social, human and political parameters must be given equally careful attention. When large scale engineering problems are under study, few people can be knowledgeable of the complete span of factors and parameters which must be considered. For these cases, solutions must be arrived at by interdisciplinary teams where each member contributes his or her own special expertise. In order to work effectively on this team, each member needs to be aware of the fundamental systems and design aspects of the problem. The rapid growth and complexity of industry have, indeed, created unusual problems; however, underlying the complexities of modern civilization and technology are similarities which make it possible to approach problems in many diverse fields with essentially the same concepts, theories and techniques.

Systems science has emerged as a scientific discipline for quantitative analysis, design and control of large classes of problems in engineering and social sciences.

The undergraduate program in Systems Design Engineering at Waterloo is a study of those basic skills required for system analysis, simulation, optimization and design. Numerous examples may be cited where these systems design fundamentals may be applied: transportation, engineering design, computer applications, water resources engineering, production, planning and scheduling, environmental pollution, education. Of course the importance of specialized expertise in these areas should not be minimized, but these skills usually work most effectively toward problem solutions when operating within an overall systems context.

The Engineering Profession

Systems Design Engineering is a unique engineering discipline which is formally accredited by the Association of Professional Engineers of the Province of Ontario (APEO). With two years of work experience beyond graduation (BASc)\(^1\), the Systems Design Engineer may apply for registration as a Professional Engineer. If a Masters degree (MASc)\(^2\) in Systems Design is also obtained, only one year of work experience is required before application.

Each province within Canada has its own Professional Engineering Association. The Canadian Engineering Accreditation Board (CEAB) is a national organization that has representation from all of the Provincial Professional Engineering Associations. The CEAB determines what types of courses must be contained in a university engineering program in order for the program to meet the standards of Canadian engineering. The Systems Design Engineering program satisfies the strict standards of the CEAB and is therefore acknowledged as a fully qualified Engineering Program. In fact, the Department of Systems Design Engineering at the University of Waterloo is the only department of its kind in all of Canada.

The Systems Design Engineering program is specifically oriented towards developing graduates who can solve problems lying at the interface of technology and the human environment. Therefore, if you are technically oriented and also have a strong parallel interest in social and human problems, Systems Design Engineering may be the right program for you.

The Department of Systems Design Engineering also offers programs leading to MASc and PhD\(^3\) degrees, and in the past many Systems Design Engineering students have gone on to complete graduate degrees. The faculty members of the Department are involved in a wide spectrum of research activities such as conflict analysis, pattern recognition, ergonomics, computer engineering, and solar energy. Students who also wish to do research in one of these areas may start at the undergraduate level by entering the combined Bachelor's - Master's program at the end of their 3B academic term. In this way they will be able to complete a Master's degree within one year after receiving their Bachelor's degree.

The Systems Design Engineering program is quite challenging. It is not easy to acquire the tools for resolving the problems of complex systems. Moreover, these tools are becoming more and more sophisticated. Thus, the average student in Systems Design Engineering is expected to work at least 50 hours per week as he or she increases in awareness of the theories of human communication, makes progress in the areas of Systems Theory, Human Systems Engineering, and Socio-Economics Systems, and absorbs the implications of the tremendous growth of electronic computing systems.

Further information is available from:
Associate Chair for Undergraduate Studies
Department of Systems Design Engineering
University of Waterloo
Waterloo, Ontario, N2L 3G1
(519) 885-1211, Ext. 2600

High School Liaison Officer
Department of Systems Design Engineering
University of Waterloo
Waterloo, Ontario, N2L 3G1
(519) 885-1211, Ext. 3182 or Ext. 2600

Footnotes
1. BASc Bachelor of Applied Science
2. MASc Master of Applied Science
3. PhD Doctor of Philosophy

Employment Opportunities

Graduates of Systems Design Engineering will find employment opportunities in a number of diverse fields. To some extent, the technical elective area chosen by the student in the third and fourth year determines more specifically what he or she does upon graduation. Some particular types of jobs which Systems Design engineers may be involved with include:
• analysis and optimization of engineering systems
• simulation and advanced computer applications
• process control and instrumentation
• operations research
• development of alternative energy sources
• design of man-machine interface
• control systems design
• socio-economic systems design
• data analysis and pattern recognition
• occupational health and safety
• product design, planning, and management
• ergonomics
• resources management
• research and development

These types of professional activities may fall within the domain of one or more engineering disciplines such as chemical, civil (e.g., structural, water resource and transportation systems), electrical (e.g., circuit design and microprocessor applications), mechanical (e.g., energy conversion and design of machines), environmental (e.g., environmental impact assessment and planning), industrial and human engineering.

UNDERGRADUATE CURRICULUM IN SYSTEMS DESIGN ENGINEERING

The Undergraduate program in Systems Design Engineering encompasses a study of the basic skills required for systems analysis, simulation, optimization, and design. In particular the first three years of the program are intended to provide each student with a broad background and capability in the areas of:

• applied mathematics
• engineering sciences and systems theory
• socio-economic systems
• human systems engineering
• computer systems and applications

Throughout these three years the student's ability to grasp real engineering problems is enhanced by courses in Systems Design methodology followed by a series of challenging problems solving experiences in the Systems Design Workshop. It is here that a focus is given to the whole curriculum and the student learns to apply the lecture material, to develop skills in solving problems that cut across the traditional disciplines, and to develop design, planning and organizational abilities.

These first three years of the program are followed by one year in which the problem solving capabilities of the student are applied with emphasis in one particular area of technology. This provides the required background for a future year of advanced study to the MASc degree, or for a rewarding career in industry or government with the Bachelor’s degree (BASc).

Systems Design Engineering Undergraduate Core Curriculum (Listed by Terms)

1A (Fall Term)
SY DE 101 Tutorial
SY DE 111 Calculus 1
SY DE 121 Digital Computation
SY DE 161 Introduction to Systems Design Engineering
SY DE 181 Physics 1 (Statics)
SY DE 183 Chemistry

1B (Spring Term)
SY DE 102 Tutorial
SY DE 112 Calculus 2
SY DE 114 Linear Algebra
SY DE 142 Introduction to Human Systems
SY DE 182 Physics 2 (Dynamics)
SY DE 192 Digital Systems

2A (Winter Term)
SY DE 201 Tutorial
SY DE 211 Differential Equations
SY DE 213 Probability
SY DE 231 Engineering Economics
SY DE 281 Mechanics of Deformable Solids
SY DE 283 Physics 3 (Electricity, Magnetism, and Optics)

2B (Fall Term)
SY DE 202 Tutorial
SY DE 214 Statistics
SY DE 252 Linear Systems and Signals
SY DE 282 Fluid Mechanics
SY DE 292 Circuits, Instrumentation, and Measurements
1 Complementary Studies Program Elective

3A (Spring Term)
SY DE 301 Tutorial
SY DE 311 Engineering Optimization
SY DE 321 Software Engineering
SY DE 351 Systems Models
SY DE 361 Introduction to Design
SY DE 381 Thermodynamics

3B (Winter Term)
SY DE 302 Tutorial
SY DE 312 Numerical Methods
SY DE 352 Introduction to Control Systems
SY DE 362 Systems Design Workshop 1
1 Technical Elective
1 Complementary Studies Program Elective

4A (Fall Term)
SY DE 401 Tutorial
SY DE 461 Systems Design Workshop 2
2 Technical Electives
2 Complementary Studies Program Electives

4B (Winter Term)
SY DE 402 Tutorial
SY DE 462 Systems Design Workshop 3
3 Technical Electives
1 Complementary Studies Program Elective
Technical Electives in Systems Design Engineering

Each undergraduate student in Systems Design Engineering must choose a technical elective package by the 3B term.

Additionally, the Faculty of Engineering has approved option programs in the following areas:

- Computer Engineering
- International Studies in Engineering
- Management Sciences
- Mathematics
- Physics
- Society, Technology and Values
- Statistics
- Water Resources

Students who complete the requirements of these "designated options" will receive a final academic transcript from the University with a statement that the option has been successfully completed. Students should refer to the earlier section on Options and Electives for Engineering Students for further information.

The Department of Systems Design Engineering offers a wide variety of technical elective courses in the third and fourth year. Students are encouraged to design their own elective programs to develop expertise in their particular interest area. Courses may be chosen from other departments as well as from Systems Design Engineering, subject to the approval of the undergraduate advisor.

The department has identified four technical elective areas within its current offerings. In each area students may want to consider courses from other departments to complement their choices within Systems Design. Additional information may be obtained from the undergraduate Associate Chair and faculty advisors. Six technical and four complementary studies electives are required during the final three terms (3B, 4A ad 4B). Students may arrange the sequencing of the elective slots to suit their program. Additional electives may be taken, with the approval of the undergraduate Associate Chair.

Many of the courses within the four departmental technical elective areas can be used as credits towards the various Faculty of Engineering Option programs. Moreover, students may find it possible to arrange their electives in such a way as to complete the requirements for more than one faculty option as well as a departmental technical elective area. To do this, students with sufficiently high grades are encouraged, subject to approval from the Undergraduate Advisor, to supplement their programs through extra courses or courses taken by correspondence during work terms.

Human Systems Engineering

The elective package in Human Systems Engineering offers students the opportunity to develop knowledge and skills applicable to the design and analysis of systems that interact closely with human beings. The department offers a selection of courses in the areas of human factors engineering and ergonomics, occupational safety, and biomedical engineering. Courses in engineering, psychology and physiological modelling provide an overview of human characteristics, abilities, and limits. Application-oriented courses show how this information can be applied in the design of interactive systems, in biomedical and clinical systems, and in the industrial workplace. In addition, students are encouraged to select other courses which complement and strengthen their chosen field of study. These might include courses in statistics and experimental design, perception and pattern recognition, physiology and kinesiology, or psychology. The elective courses in this package are as follows:

3B (Winter)
- SY DE 342 Industrial Ergonomics
- SY DE 384 Materials Engineering

4A (Fall)
- SY DE 453 Time Domain Models for Physical Systems
- SY DE 543 Engineering Psychology and Human Performance

4B (Winter)
- SY DE 372 Introduction to Pattern Recognition
- SY DE 442 Occupational and Environmental Systems
- SY DE 444 Biomedical Engineering: Human Function and Its Measurement
- SY DE 454 Computer Simulation of Systems
- SY DE 548 Design of Human-Machine Systems
- SY DE 574 Image Processing

Intelligent Systems

The Intelligent Systems elective package provides a theoretical and methodological framework for the study of "information Engineering", an emerging field that includes artificial intelligence, robotics, communication, "smart" machines, and human-computer symbiosis. The system-oriented approach emphasizes pattern analysis, since the recognition and classification of patterns is central to both human and machine intelligence, as well as finding application in many subfields of engineering. Courses in artificial perception (Image Processing) and artificial reasoning (Machine Intelligence) provide focused views in key application areas. The intelligent systems field provides one of the richest environments in which to acquire the familiarity with algorithms and data structures essential for disciplined software system design. Elective courses in this package are as follows:

3B (Winter)
- SY DE 324 Data Structures and Algorithms
- SY DE 372 Introduction to Pattern Recognition

4A (Fall)
- SY DE 423 Computer Algorithm Design and Analysis
- SY DE 453 Time Domain Models for Physical Systems
- SY DE 511 Optimization Methods for Stochastic Systems
- SY DE 513 Linear Graph Theory and Application
- SY DE 543 Engineering Psychology and Human Performance
When analysing, operating or designing a complex engineering project, a variety of interactions between the natural and social environment must be considered. Within this package are courses which present the methods and techniques for formally studying societal and environmental systems from an engineering perspective. Specifically, the courses are to provide a strong background in probability and statistics, economics, mathematical modelling (deterministic and stochastic) and decision methodologies. Additional experience may be gained by doing workshop projects in the topic areas covered in this elective package. Elective courses in this package are as follows:

3B (Winter)
- SY DE 334 Applied Statistics
- SY DE 372 Introduction to Pattern Recognition

4A (Fall)
- SY DE 511 Optimization Methods for Stochastic Systems
- SY DE 533 Conflict Analysis

4B (Winter)
- SY DE 432 Numerical Optimization
- SY DE 434 Random Processes in the Environment
- SY DE 536 Environmental Systems Models
- SY DE 574 Image Processing

Systems Modelling and Analysis
The Systems Modelling and Analysis elective package offers the student a selection of elective courses that encompasses the theory, methods and mathematics of engineering systems design. In modern engineering practice, a design engineer is increasingly confronted with complex projects involving a variety of interdisciplinary sub-systems. The engineer must understand the operation of each sub-system, and be able to integrate them together to achieve an efficient and appropriate solution to the overall problem. The Systems Modelling and Analysis elective package introduces modelling and analysis of deterministic and probabilistic systems, as well as discrete and distributed parameter systems. The courses comprising the elective package emphasize analytical as well as computer based methods; the use of currently available computer aided analysis and design packages are encouraged.

The elective package structure is such that the students enrolled in this elective package can take additional courses, possibly from other departments, in order to specialize in any specific engineering discipline and at the same time obtain a strong systems modelling and design foundation. The elective courses for this package are as follows:

3B (Winter)
- SY DE 354 Systems Models 2
- SY DE 384 Materials Engineering

4A (Fall)
- SY DE 450 Time Domain Models for Physical Systems
- SY DE 513 Linear Graph Theory and Applications
- SY DE 521 Computer Aided Theory and Applications
- SY DE 561 Stability of Systems
- SY DE 553 Advanced Dynamics
- SY DE 555 Modelling of Continuum Systems

4B (Winter)
- SY DE 372 Introduction to Pattern Recognition
- SY DE 432 Numerical Optimization
- SY DE 452 Analysis of Large Systems
- SY DE 454 Computer Simulation of Systems
- SY DE 536 Environmental Systems Models
- SY DE 574 Image Processing

Option in Management Sciences
The Management Sciences Department of the Engineering Faculty has a course package available whereby a student from another Engineering Department, such as Systems Design Engineering, can obtain a background in Management Sciences in addition to the Engineering degree. In addition to Systems Design core courses (SY DE 231, 213, 311), the Management Sciences program consists of the following optional courses:

One course from:
- M SCI 211 Organizational Behaviour 1
- or
- PSYCH 338 Organizational Psychology

Plus three courses from:
- *ECON 201 Microeconomic Theory
- M SCI 311 Organizational Behaviour 2
- M SCI 431 Operations Research 2
- M SCI 432 Introduction to Production Management
- M SCI 452 Behavioural Decision Analysis
- M SCI 461 Managerial and Engineering Economics 2
- M E 448 Production Engineering: Design of Manufacturing Systems
- SY DE 333 Applied Statistics
- SY DE 511 Optimization Methods for Stochastic Systems

*ECON 201 with a minimum of 73%

In order to complete this option successfully, students are required to obtain a grade of at least 50% in each course and an average of 60% or more on the seven courses.

For more information on this Faculty Option, refer to the earlier section on "Complementary Studies Requirements, Options and Electives for Engineering Students".
Option in Computer Engineering
The aim of this option is to augment the Systems Design Engineering curriculum with technical elective courses from Systems Design Engineering, Electrical and Computer Engineering and Computer Science Departments so that students can acquire a strong background in both hardware and software aspects of computer systems. The focus in this option will be on software development, computer interface design and applications.

In addition to the Systems Design core courses which are mandatory for this option, the following technical electives are required:

<table>
<thead>
<tr>
<th>Term</th>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>3A</td>
<td>CS 242</td>
<td>Principles of Computer Science IV</td>
</tr>
<tr>
<td>3B</td>
<td>SY DE 324</td>
<td>Data Structures &amp; Algorithms</td>
</tr>
<tr>
<td>4A</td>
<td>SY DE 423</td>
<td>Computer Algorithm Design and Analysis</td>
</tr>
<tr>
<td>4B</td>
<td>E&amp;CE 427</td>
<td>Digital Systems Engineering</td>
</tr>
</tbody>
</table>

Plus four other 300- and/or 400-level courses from Systems Design, Electrical and Computer Engineering and Computer Science, as approved by the Computer Engineering Option Advisor of the Department.
Faculty of Environmental Studies field studies trip to Presqu'ile Provincial Park.
Faculty of Environmental Studies

Introduction
The Faculty of Environmental Studies is composed of the Department of Environment and Resource Studies, Department of Geography, School of Architecture and School of Urban and Regional Planning. As a whole and within these units, the Faculty concentrates on using diverse knowledge and methods from different disciplines to understand mankind, and both built and natural environments. The Faculty utilizes the best of traditional teaching methods combined with innovative techniques to explore the many contemporary issues in environmental studies.

Architecture and Urban and Regional Planning are professional schools and, therefore, are vocation oriented. Through the Faculty of Environmental Studies, they are integrated into the mainstream of the University's concern with mankind and the environment, through the two main thrusts of research and practical applications.

The academic departments, Environment and Resource Studies and Geography have the interaction of mankind with the environment as their core. Both the Environment and Resource Studies and Geography Departments are interdisciplinary in nature and interact with many fields of study and research from the Arts, Science, Social Sciences, Mathematics, and Engineering.

One of the innovative aspects of the Faculty of Environmental Studies is the high degree of interaction among its four units. Faculty members in each School or Department participate in the programs of the other units. Interaction with other parts of the University is also fostered, and joint appointments of faculty members with other Faculties and Schools/Departments have been made. Students are not only free to, but are encouraged to, choose courses from across the whole University.

Degrees

The Faculty of Environmental Studies offers two undergraduate degrees: a Bachelor of Environmental Studies (BES), and a Bachelor of Architecture (BArch). At the graduate level a Master of Arts (MA) and a Doctoral (PhD) Degree may be obtained in both Geography, and Regional Planning and Resource Development. A Master of Applied Environmental Studies (MAES) in Industrial Development is offered by the Faculty. In addition, the Environment and Resource Studies and Geography Departments offer Joint Honours programs with many other Departments in the University (see programs for other details).

Degrees may be obtained in the following program areas:

- **BES**
  - Pre-professional Architecture (3-1/3 years on rotating work/study co-operative scheme).

- **BArch**
  - Professional Architecture (2-2/3 years with co-operative work terms following completion of the BES Pre-professional Architecture).

- **BES**
  - Honours Environment and Resource Studies (4 years).

- **BES**
  - Honours Co-operative Environment and Resource Studies (4-2/3 years with rotating work/study terms).

- **BES**
  - Honours Geography (4 years).

- **BES**
  - Honours Co-operative Geography (4-2/3 years with rotating work/study terms).

- **BES**
  - General Geography (3 and 4 years).

- **BES**
  - Honours Urban and Regional Planning (4 years).

- **BES**
  - Honours Co-operative Urban and Regional Planning (4-1/3 years with rotating work/study terms).

- **MA**
  - Geography

- **MAES**
  - Industrial Development

- **PhD**
  - Geography

- **PhD**
  - Regional Planning and Resource Development

Note

Students admitted after the Fall of 1989 will no longer be able to enrol in the four-year General Geography program.

The student should apply to the unit most suited to his/her interests. There is considerable freedom to transfer to other faculties after Year One, depending upon the student's academic record and program. Ease of transferring between the units of the Faculty of Environmental Studies varies. Transfer to the School of Urban and Regional Planning is not normally permitted above Year Two.
Admission

The admission categories, requirements and procedures for all programs are outlined in detail in Chapter 2 of this Calendar. The following points emphasize some of the admission requirements which relate specifically to programs in the Faculty of Environmental Studies.

Applicants to Environment and Resource Studies, Geography and Planning are required to present an Ontario Academic Course (OAC) credit in English. Because of the increasing use of statistics and quantitative methods in environmental research it is recommended, but not required, that students present at least one Ontario Academic Course credit or equivalent in Mathematics for admission to programs in Environmental Studies. For applicants to the School of Architecture, English or Français, Physics, Calculus, Algebra and Geometry (OAC) or equivalent are required. Finite Mathematics is recommended.

Interviews

Students being seriously considered for admission to the School of Architecture are normally required to participate in an interview as part of the admissions process. In addition, a test in the form of a précis will be required of applicants on the day of their scheduled interview. A portfolio of creative work must also be submitted at the time of the interview. Contact the School of Architecture for further details.

Selected applicants to the School of Urban and Regional Planning are normally required to come to the University for an interview as part of the admission process. Selection for the interview is based on Grade 12 and university-entrance level academic records. Admission is based on the results of the interview, letters of reference, a 'Personal Information Form', and secondary school achievement. Contact the School of Urban and Regional Planning for further details.

Transfer Credit

Generally transfer credit is given for courses in which a grade of 60% (C−) or better was obtained. Students transferring from other institutions may have their transferred courses count toward the University of Waterloo degree as determined by the admissions officer of the particular program. Marks obtained in these courses will not be included in the calculation of the student's average.

Environmental Studies

Examinations and Standings

Students transferring from Faculties within the University, or former University of Waterloo students returning after an absence, generally have the option of either transferring previous UW courses with 60% (C−) or better without including these in cumulative average or transferring all relevant courses passed and including all courses passed and failed in the cumulative average. The specific transfer credit policies vary with each program or Faculty and students are advised to refer to the program or Faculty sections in the Calendar for detailed regulations.

English Language Proficiency Program

The Faculty of Environmental Studies expects that students enrolled in any of its programs should be able to demonstrate competence in writing. Accordingly, all students newly admitted to the Faculty are required to write the English Language Proficiency Examination during their first term of registration (normally scheduled during registration week in September). Effective August 1989, students who have attained a final grade of 80.0 or higher in English OAC 1 (no substitutes) are exempt from writing the ELPE and will be considered to have satisfied the ELPE requirement. Students may demonstrate their competence in writing by achieving a passing grade on this Examination. If students do not achieve a passing grade on this examination, they must successfully complete the assignments of the English Language Proficiency Program. The English Language Proficiency Program is recorded on students' academic records as ARTS 000Y.

The passing grade varies with each academic program. Please contact the Undergraduate Officer for your particular program for further details.

Examinations and Standings

The following regulations govern the practise of the Faculty of Environmental Studies in regard to final examinations, standing, and make-up examinations. These regulations also apply to part-time students and special programs. Further details concerning University Examination Regulations can be found in Chapter 1.

A maximum of 13 first-year term courses will be counted towards a BES. For other requirements, see the program section for the Department/School.

Students should note that the Faculty of Environmental Studies operates under a "term course system", except in Architecture, in which student progress is measured by term courses successfully completed rather than by years. A term course is a course with a credit weight of 0.5. Students who have passed fewer than ten term courses will be considered Year One students; those who have passed at least ten...
but fewer than 20 will be considered Year Two students; those with at least 20 but fewer than 30, Year Three; and those with 30 or more, Year Four.

Final Examinations
1. In all courses each student is required to submit (in such form and at such time as may be determined by the instructor) evidence of satisfactory participation in term work. The marks obtained from work during term are used in part in determining standing. At the discretion of the chairperson of the Department or the Director of the School concerned and of the Dean, a student may be barred from the final examination if the course requirements are not completed to the satisfaction of the instructor.

2. Failure to write an examination is ordinarily considered a failure to pass (F-). A student who defaults a final examination, except for a properly certified reason, shall have no make-up examination privileges and may be required to repeat the work in class. If a student fails to write for medical reasons, a Doctor’s certificate covering the precise period of absence must be filed in the Registrar’s Office within one week of the set examination date.

3. A student will be eligible for make-up examinations only when failure to pass is attributable to extraordinary circumstances. In addition, students:
   a) must have attended a reasonable number of lectures in the course in which they propose to write, and must have satisfied all term work requirements;
   b) must have secured the permission of the professor concerned.

Petitions, Re-assessments and Appeals
A PETITION involves instances where a student seeks relief from normal Faculty or University rules and regulations because of special circumstances normally beyond his or her control such as illness or bereavement. Petition forms are available at departmental offices and the Registrar’s Office. Appropriate supporting documentation must accompany all petitions.

A request for REASSESSMENT or a re-read may be initiated by a student who is convinced that the grade received in an examination, essay, or other piece of academic work is unreasonable. The first step in this process is for the student to approach the course instructor and attempt to work the matter out informally. This initial step must take place within four months of the receipt of the grade. If the problem cannot be resolved in this way, the student may submit an Application for Federal Inquiry to the Faculty’s Associate Dean for Undergraduate Studies.

A student who believes that an error in academic judgment or procedure has occurred may initiate an APPEAL. Whenever possible, an informal approach to the person whose judgment is being questioned should precede a formal appeal. Failure to reach a mutually satisfactory solution at the informal level may result in the student submitting an Application for Formal Inquiry to the Associate Dean for Undergraduate Studies. A formal appeal must be submitted within six months following the action being appealed.

At the informal and formal level students are encouraged to seek advice and assistance from the Undergraduate Associate Dean, Assistant Registrar, University Secretariat and/or the Ombudsperson. Please refer to page 1:10 for more information on the Student Appeal Policy and Procedures.

Submission of Course Material
In situations where a student wishes to submit a body of material to satisfy the requirement of more than one course, the student must notify the instructors of both courses of his/her intention where the courses are concurrent so that they may each decide what is appropriate for their own course.

When one of the courses has been taken in a previous term, the current course instructor must be informed by the student of his/her intention of submitting the same course material. The current instructor has the final decision on the extent to which the material is allowed.

Failure of a student to comply with the above regulation constitutes an academic offence.

Standing
1. Standing in an individual subject is determined by combining the marks assigned for term work with those obtained in the final examination. For the purpose of grading, the University Grading System described in Chapter 1 will be used.

2. Except in Architecture, all courses taken from May 1984 to the present whether passed or failed are included in the cumulative overall and major averages except for repeated courses in which case only the latest course attempt and grade are included. The first grade will, however, remain on the student’s record. Students (except those in the School of Architecture) should note that their major average is determined by the cumulative average of grades assigned for all courses taken in the student’s major program including those with the Environmental Studies designation.

3. Students receiving an incomplete (INC), or no mark received (NMR) standing in any course will be allowed four months from the completion date of the course to clear such standings. Any such standings not cleared within this period will automatically be converted to a grade of F-. In the School of Urban and Regional Planning, this grade cannot be changed without a student appeal to the School. The mark of “IP” or “In Progress” may be
Environmental Studies
Examinations and Standings

1. assigned temporarily to the first half of what is essentially a year course which is listed as two term courses (i.e. PLAN 490A and 490B). The mark indicates that the course is "In Progress" and that when completed, a final grade will be assigned to both the 'A' and 'B' halves of the course (usually the same grade). The mark "IP" will automatically revert to F after eight months, if a final grade is not submitted.

2. Some courses which are listed under separate labels or numbers have overlapping content. Only one of these courses may be taken for credit. These are designated with notes after the courses which would indicate one of the following:
   - the courses are cross-listed;
   - credit will only be granted for one of a pair of courses;
   - a course formerly was designated with a different number and/or label; or
   - students should consult their Undergraduate Officer or refer to the current Undergraduate Handbook.

3. To be considered in good standing in the Honours programs, a student must maintain a cumulative overall average of at least 65.0% and a cumulative major average of at least 70.0%. If an Honours program candidate's average falls below the prescribed minimum, the individual can be given conditional standing for two consecutive academic terms if in the opinion of the School or Departmental Promotions Committee the person can attain Honours standing before graduation. If not, the student, upon request, may be considered as a candidate for a degree in the General Geography Program and the regulations in #7 below will apply.

4. To be considered in good standing in Honours Co-operative programs, in addition to maintaining the required minimum cumulative averages, students must complete and submit satisfactory Co-op work reports at the completion of their first four Co-op work terms. A minimum of four satisfactory work reports are required for the Honours Co-operative degree.

5. To be considered in good standing in the General Geography programs, a student must maintain a cumulative overall average of at least 65.0% as well as an average of at least 65.0% in Geography. If at any time a student's cumulative overall average falls below 60.0% or the average in the major subjects below 65.0%, the individual may be granted conditional status for two consecutive academic terms during which period he/she must obtain good standing or he/she will be asked to withdraw.

6. There are three-year programs in the Department of Geography and the School of Architecture. The latter is a pre-professional program, on a Co-operative basis, which prepares for and leads into the two-year professional BArch program.

7. Full-time students may be enrolled for additional or fewer courses than the normal course load as required in each program only after obtaining the approval of the appropriate Undergraduate Officer.

8. Even while otherwise in good standing, a student who fails more than four term courses or the equivalent over the academic year or who, in the opinion of the School or Departmental Promotions Committee, is deemed not to be profiting from University studies may be required to withdraw regardless of his/her cumulative average.

9. If a student receives a "Required to Withdraw" or a "May Not Proceed" decision, he or she must withdraw from that program for two academic terms; that student is entitled to apply to any other program; if the reasons for withdrawal include disciplinary problems, a statement will be placed in the student's file.

10. Generally, students wishing to graduate with a University of Waterloo Bachelor of Environmental Studies (BES) undergraduate degree must spend a minimum of two years or their final year in residence (full-time on campus). Architecture students wishing to graduate with a University of Waterloo BES degree must spend the equivalent of four terms of full-time study in residence including the final two terms. Architecture students wishing to graduate with a University of Waterloo BArch degree must spend the last two terms in residence. This does not preclude special studies approved in advance. Architecture students who choose to undertake alternate studies to the Waterloo 3B term may not graduate with a BES (pre-professional) degree because of the residence requirements. Students who do not have a BES (pre-professional) degree from Waterloo and wish to return to continue studies here in fourth year will be considered as external applicants.

Dean's Honours List
In order to officially recognize students who have attained a consistent high degree of academic excellence during their studies in the Faculty of Environmental Studies, the Faculty awards the distinction of 'Dean's Honours List'. This distinction is awarded to selected students at the completion of each academic term and appears on the Student Examination Report and on the Official Transcript as part of the academic decision.

To be eligible for this distinction, students must:

1. have completed a minimum of ten UW courses which count in the cumulative overall average,

2. in Environment and Resource Studies, Geography and Urban and Regional Planning, have a cumulative
overall average of 80.0% or higher; in Architecture, students must be in the top 5% of the class.

3. have no marks of INC or NMR or failing grades in their last term.

Academic Programs

Students who have not determined the field or subject in which they wish to concentrate should study the Calendar carefully. After examining the suggested departmental program, the student should read the descriptions of individual courses in order to have a more comprehensive idea of what the content of any program would include. Students should consult their High School Guidance Officer, Chair or Undergraduate Officer of any University department, or the Registrar, by letter or in person for additional clarification and information.

The Calendar is designed to enable students to make a wise choice of the programs and courses while at the University of Waterloo. Students are encouraged to consult the Undergraduate Officer of the appropriate School or Department. The Secondary School Liaison Officer and the Assistant Registrar for Environmental Studies will also respond to written or personal inquiries.

Course and Program Changes

1. Students may add and drop courses before and during the first two weeks of classes in the term in which the courses begin.

2. After the two week periods, and before November 1, March 1, and July 1, a student may add courses only with the written permission of the course instructor and the appropriate Undergraduate Officer.

3. After the two week periods, and before November 1, March 1, and July 1, a student may drop courses only with the written permission of the course instructor and the appropriate Undergraduate Officer and after demonstrating that such a change is in the student’s academic interest. The mark of "IP" or "In Progress" may be assigned to the first half of what is essentially a year course which is listed as two term courses (i.e. PLAN 490A and 490B). The mark indicates that the course is "In Progress" and that when completed, a final grade will be assigned to both the A and B halves of the course (usually the same grade). The mark "IP" will automatically revert to F - after a specified period of time. When the second or B half of such courses is dropped as a result of schedule change or withdrawal, the first half must be dropped.

4. Students in the Faculty of Environmental Studies may not take any courses on an audit basis.

Environmental Studies

Academic Programs

5. All schedule changes at any time must be submitted to the designated department/school office.

6. Students are encouraged not to register for more courses than their programs require unless exceptional circumstances can be demonstrated.

7. Full-time students may reduce their programs below the specified minimum only upon the recommendation of the undergraduate officer of the major department/school.

8. Courses not dropped by the deadlines specified in c) will be graded and included in the calculation of the student's average.

Voluntary Withdrawals

Students may voluntarily withdraw from their program of study without incurring academic penalty, provided that the appropriate Notice of Withdrawal form is completed, received and signed by the Undergraduate Officer, no later than: November 1 (Fall Term), March 1 (Winter Term), July 1 (Spring Term). After these deadlines, students who withdraw will normally be held responsible for the term's courses in the sense that such courses will be recorded with a grade of "NMR" and subsequently will be recorded as failures. The notation 'Voluntary Withdrawal' with the effective date appears on the official transcript for each term for which a voluntary withdrawal has been processed. Students who voluntarily withdraw may be eligible for tuition fee and residence refunds depending on the effective date of withdrawal. (See the Academic Calendar.)

Minors

Students may concentrate study in an associated field to the extent it becomes a Minor (typically ten term courses; consult the Minor Department) within Honours programs in the Faculty of Environmental Studies. A Minor can be in any area such as Anthropology, Canadian Studies, Chemistry, Management Studies, Personnel Studies, Psychology, etc.

Options

Students can elect to take one of the recognized University Options. Consult Chapter 15 of the Calendar for more information on Interdisciplinary Programs.

Notes:

Normally a student may not double-count any course for more than one option or minor. Students who intend to have an Interdisciplinary Option recognized on their transcripts must communicate that intention to the director of the Option by the start of Year Three.

Correspondence Courses

Only in exceptional cases would correspondence courses be taken by a student during a term in which he or she was a full-time student on campus.
Special Programs
Student exchange agreements between Waterloo and
the School of Australian Environmental Studies at
Griffith University, Brisbane, Queensland, the
environmental studies program at Victoria College,
Clayton (near Melbourne), Victoria, and the Royal
Melbourne Institute of Technology, Melbourne have
been established. Under these arrangements, a small
number of students from the University of Waterloo
could take courses at Griffith, Victoria or RMIT which
would be credited towards their degree at Waterloo,
and vice versa. For additional information, contact the
Associate Dean, Undergraduate Studies.

Certificate in Environmental Assessment
The University of Waterloo and Lakehead University
jointly offer a certificate for the successful completion
(C - average or better) of the following five courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
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<tbody>
<tr>
<td>ENV 3195</td>
<td>Introduction to Environmental Studies</td>
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<tr>
<td>ERS 241</td>
<td>Introduction to Environmental and Social</td>
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<td></td>
<td>Impact Assessment</td>
</tr>
<tr>
<td>ERS 337</td>
<td>Biophysical Impact Assessment</td>
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<tr>
<td>ERS 338</td>
<td>Socioeconomic Impact Assessment</td>
</tr>
<tr>
<td>ERS 445</td>
<td>Impact Assessment and Policy Analysis: Practicum</td>
</tr>
</tbody>
</table>

The following statements outline the objectives and
nature of the four programs in the Faculty of
Environmental Studies.

School of Architecture

Nature of the Program
Architects organize spaces within and about buildings.
They determine the shape a total building will take
and how it is to be built. They design, at a large scale,
with an awareness of the demands of society. The
design in detail with attention to the needs and
aspirations of individuals and groups. They show
understanding of structural technique, construction
detail and the sound use of materials. They determine
the way in which the building will be built and
supervise the construction process.

Architecture is a vast spread of concerns about
people and their surroundings, their history, cultures,
resources, disciplines and contradictions. The School's
primary concern is the development of design skills in
architecture, and it stresses awareness of cultural
background and existing environment.

The five year academic program in Architecture is
intended to prepare the student to become an
architect capable of practice within contemporary
professional constraints and capable, too, of
adaptation to a changing profession and to the society
it serves.

The five years of architectural studies are made up
of: a pre-professional, three-year Bachelor of
Environmental Studies program followed by a two-year
professional program of study for the Bachelor of
Architecture degree. Both programs are on the Co-
operative system (Chapter 5) which consists of
alternating periods of academic study and practical
work experience.

Degrees
The Pre-Professional Architecture program comprises
six academic terms of study and three four-month Co-
operative work terms leading to the degree, Bachelor
of Environmental Studies (BES Pre-Professional
Architecture). This degree, combined with a cumulative
average of C- in design studio theme courses,
indicates appropriate preparation for four subsequent
academic terms of study and two Co-operative work
terms, each of eight months duration, leading to the
degree, Bachelor of Architecture (BArch).

Professional Recognition
The Ontario Association of Architects accepts the
degree of BArch as fulfilling the academic requirements
for registration to practise. Graduates wishing to
proceed to registration are required to submit their
credentials to the RAIC Certification Board for
assessment. For further information concerning
mandatory work experience and other requirements for
registration contact the Registrar, O.A.A., 50 Park
Road, Toronto, Ontario M4W 2N5. The Waterloo
BArch Degree is recognized by the Commonwealth
Association of Architects.

Non-Architecture Students
Students not enrolled in the School of Architecture
may take any architectural course listed in the
recommended core program (depending on availability
of space) with the exception of courses in the theme
area of Design. Prerequisites indicated in the course
descriptions are primarily for Architectural students.
For Non-Architectural students, prerequisite evaluation
must be carried out by the respective instructors.

Bachelor of Environmental Studies
(Pre-Professional Architecture) Program
The purpose of the BES program is to educate future
architects to an understanding of the beliefs and
needs of the individual and of society, and to a
willingness to take an active role in creating and
improving the environment; to a clarification of the
interaction of seemingly unrelated disciplines, and to
know the principles and values that surround the
creation of any artifact; to a comprehension of the
many forms of creative expression; and to an
understanding of the present as part of an historical
process. The program aims to build knowledge and
expertise in various aspects of building and
architectural design through:

1. The design studio, theories and methods, and
   practice of architectural design.
2. Approaches in the study of technology including
   computer, physical and material sciences.
3. Environmental studies, including natural and human ecology.

Theme Area Descriptions

Technology
Courses in this theme area give preparation leading to the application of mathematics, and computer science as tools for analysing quantitative and behavioural problems as prerequisites for ensuing studies; to develop an understanding of the qualities of materials and structural behaviour; to propose alternatives in structural engineering; and to perform independent mathematical checks on simple, statically determinate and indeterminate structures.

Ecology
Courses in this Theme Area prepare the student to understand the structure and function of Man in the pre-existing environment as an individual and as a social animal; to recognize and be critical of the human/physical complex and its management for desirable human goals and quality in the natural and man-made Environments.

Culture
Courses in cultural history give the student a critical and creative understanding of the basic ingredients of all creative work, recognizing the seemingly unrelated forces for change in the cultural history of man, and comprehending the present as part of the historical past. Open to any University student upon consent of instructor. No prerequisites are required for these courses except for Architecture students.

Design
The courses in design studio combine design fundamentals and design concepts, along with the opportunity to involve analysis and synthesis, professional and scientific insights, application of tools and methods for designing artifacts for man, and an awareness of the inherent physical characteristics and limitations of media and materials. The objectives of the studio are: (1) to guide the student in observing aspects of the physical and social environment; to find, categorize and associate the information into fundamental structures and patterns of relationships; (2) to apply theories generated in the lecture courses to situations in the physical environment, implementing by categorizing the courses into behaviour materials, structures and mechanical systems, behaviour of man, and communications; (3) to provide the student with an opportunity to develop skill in using different “techniques” for analyzing and synthesizing problems in the physical environment; (4) to establish a relationship between faculty and students; (5) to provide a vehicle for persons from faculties of different disciplines and from outside of the University to discuss with students their problems and projects from different points of view.

Bachelor of Architecture Program
The Bachelor of Architecture program increases the emphasis on architectural design and professional aspects of architecture. There are opportunities for students to develop their own areas of interest, and the final two terms of the program are normally devoted to a design thesis.

The courses for the Bachelor of Architecture Program are intended to prepare the student to demonstrate professional skill in separating, organizing, and conceptualizing actual problems in the man-made environment in his/her role as an architect, alone and in a team; to synthesize mechanical, structural and functional systems into architectural expressions which adapt to social needs and aspirations of society, user, client and community, alone and with the help of others; to adapt his/her skills to (a) real world constraints; (b) to the evolution of social economic and technological changes, and (c) to influence change both in constraints and environmental problems and know the current methods and procedures in professional practice for defining and solving environmental problems, to organize patterns of behaviour which assure continuing development for professional competence and relevance at all times; and to pass the examination for registration as an architect if he/she aspires to become a practising professional.

Note
Students are expected to defray costs of materials in connection with studio projects. There is a $25.00 studio fee for each term.

See Recommended Core Program for course arrangement, page 11:9.
## PROGRAM FOR THE DEGREE OF BACHELOR OF ENVIRONMENTAL STUDIES
(Pre-Professional Architecture)

<table>
<thead>
<tr>
<th>Year/Term</th>
<th>Technology Theme Area</th>
<th>Ecology Theme Area</th>
<th>Culture Theme Area</th>
<th>Design Theme Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-A</td>
<td>ARCH 112 Mathematics</td>
<td>ARCH 124 An Introduction to Landscape Design</td>
<td>ARCH 142 Iconography I (2 term courses)</td>
<td>ARCH 192 Design Fundamentals (3 term courses)</td>
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<tr>
<td>Fall</td>
<td>ARCH 171 Theories and Technologies of Building</td>
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<tr>
<td>Sept-Dec</td>
<td>ARCH 113 Introduction to Computer Usage in Architecture</td>
<td>ARCH 143 Iconography II (2 term courses)</td>
<td>ARCH 193 Design Fundamentals and Studio (3 term courses)</td>
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<td></td>
<td>ARCH 163 Statics and Structural Analysis</td>
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<td></td>
<td>ARCH 172 Building Construction I</td>
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<tr>
<td>1B</td>
<td>ARCH 113 Introduction to Computer Usage in Architecture</td>
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<tr>
<td>Winter</td>
<td>ARCH 163 Statics and Structural Analysis</td>
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<tr>
<td>Jan-Apr</td>
<td>ARCH 172 Building Construction I</td>
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<tr>
<td>Off-Term</td>
<td>Students are free to use the off-term as they wish. The Department of Co-operative Education does not provide its normal services</td>
<td>to arrange employment for students in this term. (See Chapter 5.)</td>
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<tr>
<td>Spring</td>
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<td>May-Aug</td>
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<tr>
<td>2A</td>
<td>ARCH 262 Strength of Materials FE</td>
<td>ARCH 246 Foundations of Europe (2 term courses)</td>
<td>ARCH 292 Design Concepts and Studio (3 term courses)</td>
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<tr>
<td>Fall</td>
<td>ARCH 266 Building Construction II</td>
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<tr>
<td>Sept-Dec</td>
<td>TOTAL 8 term courses</td>
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<tr>
<td>Co-op Work Term 1</td>
<td>For all Co-op terms, job interviews are arranged on campus during the preceding study term by the Department of Co-operative Education, which maintains liaison with prospective employers. The experiences a student may have during this work term might include: the introduction to office procedures, assisting in design presentations and model building, minor drafting assignments.</td>
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<td>Winter</td>
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<td>Jan-Apr</td>
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<tr>
<td>2B</td>
<td>ARCH 276 Timber: Design, Structure and Construction</td>
<td>ARCH 225 Patterns of Perception: Landscape and Settlement</td>
<td>ARCH 247 Renaissance to Revolution (2 term courses)</td>
<td>ARCH 293 Design Concepts and Studio (3 term courses)</td>
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<td>Spring</td>
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<td>May-Aug</td>
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<td>Co-op Work Term 2</td>
<td>The types of experiences a student may have during this work term might include: assisting in design presentation and model building, assisting in the preparation and corrections to site plans, floor plans and elevations, on-site measurements.</td>
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<tr>
<td>Fall</td>
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<td>Sept-Dec</td>
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<tr>
<td>3A</td>
<td>ARCH 362 Steel: Design, Structure and Construction FE</td>
<td>ARCH 392 Design Concepts and Studio (4 term courses)</td>
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<tr>
<td>Winter</td>
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<tr>
<td>Jan-Apr</td>
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<tr>
<td>TOTAL 7 term courses</td>
<td>ARCH 372 Building Services I</td>
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<td>Co-op Work Term 3</td>
<td>The types of experiences a student may have during this work term might include: design research, detailed design developments, design presentation, assisting in the preparation of site plans, floor plans and elevations, building cross-sections.</td>
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<td>Spring</td>
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<td>May-Aug</td>
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<tr>
<td>3B</td>
<td>ARCH 363 Concrete: Design, Structure and Construction FE</td>
<td>ARCH 393 Design Concepts and Studio (4 term courses)</td>
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<td>Fall</td>
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<td>Sept-Dec</td>
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<tr>
<td>TOTAL 7 term courses</td>
<td>ARCH 373 Building Services II</td>
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<td>TOTAL 46 term courses</td>
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</table>
PROGRAM FOR THE DEGREE OF BACHELOR OF ARCHITECTURE

<table>
<thead>
<tr>
<th>Year/Term</th>
<th>Technology Theme Area</th>
<th>Culture Theme Area</th>
<th>Design Theme Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Co-op Work Terms</td>
<td>After the first degree program (BES) is completed, this period of eight months may serve many objectives, including the choice of returning to the School for the second degree program (BArch). Students might also choose to continue the Co-op work term program.</td>
<td>and obtain experience in design research (by assisting in the development of conceptual designs and schematics, by preparing site plans and details, floor plans, elevations, cross-sections and standard details) and assisting the site architect or construction superintendent.</td>
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<td>4 &amp; 5 Winter and Spring</td>
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<tr>
<td>Jan-Aug</td>
<td>ARCH 348</td>
<td>ARCH 446</td>
<td>ARCH 492</td>
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<td></td>
<td>Italian Renaissance</td>
<td>Italian Urban History</td>
<td>Design Studio</td>
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<td></td>
<td>Architecture</td>
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<td>(4 term courses)</td>
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<td>Sept-Dec</td>
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<td>TOTAL 7 term courses</td>
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<td>TOTAL 7 term courses</td>
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<td>4-A ARCH 346 ARCH 446 ARCH 492</td>
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<tr>
<td>Fall</td>
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<tr>
<td></td>
<td>The Financial Aspects of Architecture</td>
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<td>ARCH 452 (0.25) or Specifications</td>
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<td>See Note 4 below</td>
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<td>Jan-Apr</td>
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<td>Winter</td>
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<td>ARCH 499</td>
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<td>Professional Practice</td>
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<td>ARCH 453 (0.25) or Acts and Codes</td>
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<td>May-Aug</td>
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Additional Regulations, Examinations and Promotions

In order to proceed unconditionally from one term to the next in the BES and BArch programs, the student must satisfy each of the following requirements:

1. Maintain a minimum cumulative overall average of C- (60.0) calculated at the end of each term of study.
2. Pass the studio course.
3. Not fail** more than one half course or equivalent (excluding studio) in any single term.

*A term of study refers to a particular four-month period of registration including the 1N Fall and Winter terms and all ‘A’ and ‘B’ terms.

**A minimum passing grade in any course is D- (50.0).

While the School reserves the right to make exceptional academic decisions for students who require exceptional consideration, the Promotions Committee will be guided by the following:

Students who satisfy at least two of the above requirements in a given term may be permitted to continue conditionally in the program as outlined in NOTES 1, 2, 3, 4 and 5.

Promotions decisions for students who satisfy only one of these requirements in any given term will be made on an individual basis by the Promotions Committee.

Students who satisfy one or none of the above requirements in a given term will normally receive the decision “Required to Withdraw.”

No supplemental examinations are given by the School of Architecture.

1. Cumulative Average

Students who fail to maintain the minimum cumulative overall average requirement but who satisfy the other two requirements will receive the academic decision “May not Proceed.” At the discretion of the Promotions Committee such students must raise their cumulative average to a minimum of C- (60.0) by repeating the term or by repeating courses which are detrimental to their average and/or by taking approved elective courses before enrolling in the next higher level core or studio courses. The minimum cumulative average must be attained within the next calendar year. Failing this, the student will be required to withdraw. Failure to maintain the minimum cumulative average of C- (60.0) by the end of the next higher level term will result in the academic decision “Required to Withdraw.”

2. Studio Courses

Students who fail a studio course (AHCH 192, 193, 292, 293, 392, 393, 492, 493, 592, 593) but who satisfy the other requirements will receive the academic decision “May not Proceed.” Such students must repeat and pass the studio course. Failure to pass the studio in question on the second attempt will result in the academic decision “Required to Withdraw.” Students may not register in any higher level studio course or core courses until the failed studio course is passed. Credit will be retained for courses passed in a term in which a studio course is failed.

3. Elective Courses

Students who fail more than one term elective course or equivalent in any single term (but who pass studio and maintain the minimum cumulative overall average) will receive the academic decision “Proceed on Probation.” Failed elective courses or their equivalents must be repeated and passed by the end of the next term of study (which includes the higher level studio and core course(s)). Should the student fail more than one half course or equivalent in the next term, the student will receive the academic decision “Required to Withdraw.”

4. Core Courses

Students who fail or achieve Incomplete status in two or more one-term courses or equivalent in any single term, including the 4A Rome term, and students who accumulate three or more failed or Incomplete courses over a period of time (but who pass studio and maintain the minimum cumulative overall average) will receive the academic decision “May not Proceed.” The failed core courses or equivalent must be repeated and passed before the student may register in any higher level studio or core courses. Should the student fail two or more one-term courses or equivalent in the next term, the student will receive the academic decision “Required to Withdraw.”

5. Conditional Status

Notwithstanding the provisions of Notes 1-4, students who have been granted conditional status in a previous term during the course of the BES (Pre-professional) program will be required to withdraw if at any subsequent time they fail to meet any one or more of the three basic requirements for unconditional promotion as stated in 1, 2, 3 under “Additional Regulations, Examinations and Promotions.”

Similarly, students who have been granted conditional status on one previous occasion during the course of the BArch program will be required to withdraw if at any subsequent time they fail to meet any one or more of the three basic requirements for unconditional promotion stated in 1, 2, 3 under “Additional Regulations, Examinations and Promotions.”

6. Course Loads

Normally students of the School are permitted to take only one more or one fewer term courses than that prescribed for the particular year and term in which they are registered. Any further addition or reduction to the student’s program must be approved by the Undergraduate Officer of the School of Architecture.
complex relationships, along with related study in
towards study of the many dimensions of human inter-
natural and managed landscapes, buildings and cities,
relationships with various environments, including
small groups, communities, and whole societies.

through problem- and issue-oriented inquiry into such

co-operative work-terms, of eight months each. The work-terms
must be approved by the Department of Co-ordination and Placement.

The "off-term" in the Bachelor of Environmental Studies pre-professional program follows the first two
terms of study (from September to April) in Year One. Students may use the "off-term" as a vacation period or they may seek temporary employment. Any employment arrangements made for the "off-term" are the student's own responsibility. The terms are arranged as indicated on the charts in Chapter 5.

The Department of Environment and Resource Studies
Nature of the Program
The Department of Environment and Resource Studies offers both an Honours Regular program and an Honours Co-operative program.

These two Honours degree programs are oriented towards study of the many dimensions of human inter-relationships with various environments, including natural and managed landscapes, buildings and cities, small groups, communities, and whole societies. Through problem- and issue-oriented inquiry into such complex relationships, along with related study in

co-operative work-terms and one "off-term." The subsequent Bachelor of Architecture program consists of four terms of academic study and two co-operative work-terms, of eight months each. The work-terms must be approved by the Department of Co-ordination and Placement.

Note
The "off-term" in the Bachelor of Environmental Studies pre-professional program follows the first two terms of study (from September to April) in Year One. Students may use the "off-term" as a vacation period or they may seek temporary employment. Any employment arrangements made for the "off-term" are the student's own responsibility. The terms are arranged as indicated on the charts in Chapter 5.

Objectives of the Work Term
The Co-operative work-terms are designed to provide the student with knowledge of present day practice in architecture and to develop within the student practical skills essential for the practicing architect today.

Work opportunities are developed in private architectural departments, and construction and development companies. Drafting abilities, methods of construction, division of sub trades, construction supervision, real problem solving, and the disciplines of time and money will be learned during the work terms.

At the completion of the work terms the student who has taken full advantage of the opportunities offered will have a thorough understanding of the current methods and procedures used in the design and construction of building, sufficient ability and adequate mature judgment to assume responsibility for any medium-sized building project.

Environmental Studies
Architecture
Environment and Resource Studies

7. Appeals
See Faculty procedure, page 11.4.

Co-operative Programs
The Bachelor of Environmental Studies program includes six terms of study, three four-month co-operative work-terms and one "off-term." The subsequent Bachelor of Architecture program consists of four terms of academic study and two co-operative work-terms, of eight months each. The work-terms must be approved by the Department of Co-ordination and Placement.

Note
The "off-term" in the Bachelor of Environmental Studies pre-professional program follows the first two terms of study (from September to April) in Year One. Students may use the "off-term" as a vacation period or they may seek temporary employment. Any employment arrangements made for the "off-term" are the student's own responsibility. The terms are arranged as indicated on the charts in Chapter 5.

Objectives of the Work Term
The Co-operative work-terms are designed to provide the student with knowledge of present day practice in architecture and to develop within the student practical skills essential for the practicing architect today.

Work opportunities are developed in private architectural departments, and construction and development companies. Drafting abilities, methods of construction, division of sub trades, construction supervision, real problem solving, and the disciplines of time and money will be learned during the work terms.

At the completion of the work terms the student who has taken full advantage of the opportunities offered will have a thorough understanding of the current methods and procedures used in the design and construction of building, sufficient ability and adequate mature judgment to assume responsibility for any medium-sized building project.

Department of Environment and Resource Studies
Nature of the Program
The Department of Environment and Resource Studies offers both an Honours Regular program and an Honours Co-operative program.

These two Honours degree programs are oriented towards study of the many dimensions of human inter-relationships with various environments, including natural and managed landscapes, buildings and cities, small groups, communities, and whole societies. Through problem- and issue-oriented inquiry into such complex relationships, along with related study in

contributing academic disciplines, ample scope is provided for acquiring a broad-based education, as well as technical knowledge and skills.

The current emphases in research and scholarship among the faculty fall into three major thematic areas:

1. Sustainable Environmental and Resource Systems
2. Environmental, Social and Technological Impact Assessment
3. Natural Area Management

Many of the positions held by graduates of the Department can be described by one of these headings.

An even more important goal of the programs offered by the Department is the development of abilities to think and to analyse which are not artificially constrained by conventional boundaries of academic disciplines. The importance of the ability to analyse environmental situations from a broad perspective derives from the recognition that the complex inter-related problems of the contemporary world and of the future will only be resolved through this type of approach. These problems require attention from people who not only have specialized technical abilities, but also have increased perspective, awareness and understanding. They must also have the ability to work effectively in co-operation with others and to take responsibility for the human, social, and environmental implications of the results.

The Environment and Resource Studies programs do not concentrate on one technical or pre-professional field to meet specifications for particular jobs. Rather, by presenting a wide range of subjects and problems inherent in the theme of human-environment inter-relationships, the programs allow students to see for themselves what the needs of society are. Through selection of topics for study within required courses, through selection of electives, and through summer work experiences in the Regular program and work-term experiences in the Co-operative program, students can equip themselves for careers which will meet these societal needs.

The flexibility of Environment and Resource Studies sets the stage for work in a number of environmentally-related and societal areas.

Some graduates of the Department of Environment and Resource Studies further enhance their qualifications through graduate study.

Graduates holding the BES degree in Environment and Resource Studies have found employment in a range of government agencies in fields such as natural resources management, pollution control, social services planning, and urban affairs as well as with private corporate and consulting firms in the communications industry and environmental design; with other universities as full-time teaching or research personnel, and with community agencies in various
social programs and as community organizers. Others who have graduated from Environment and Resource Studies have gone on to post-graduate work in programs such as urban and metropolitan studies, natural resources administration, regional planning, environmental engineering, law, systems design, teacher training, adult education, and communications studies.

The Department is fortunate in having a multi-disciplinary faculty whose formal education and experience range over a number of disciplines in the natural sciences, social sciences and the fine arts. They bring to the program qualifications in such fields as agriculture, biology, communications, economics, geography, law, mathematics, physics, political science, and sociology, as well as a variety of experiences in such diverse areas as ecological research, economic studies, urban affairs, technology assessment, and work with various international organizations.

For the approach used in Environment and Resource Studies, considerable academic innovation has been desirable. Besides lectures and labs, the program emphasizes open-door, personal contact among students and faculty members; student-selected projects and community work; field trips to environments other than lecture halls; team teaching; a regular flow of visitors from outside the University; and workshop instruction to help develop techniques and skills relevant to environmental studies. Students in both the Regular and Co-operative Environment and Resource Studies programs are encouraged to relate aspects of their academic program to summer or work-term employment. This employment may include involvement with community organizations, and self-generated activity, and students incorporate this experiential learning into the university-based educational process.

For many students a “theme”-oriented program of this kind offers a more satisfying undergraduate education than traditional alternatives. Environment and Resource Studies started at Waterloo in 1969 and as an undergraduate degree program it is unique in Canada although similar ones have become established in the United States, Europe and Australia.

More information may be obtained from the Undergraduate Officer, Department of Environment and Resource Studies.

Bachelor of Environmental Studies (Honours Environment and Resource Studies)
The formal admission requirements of the program are listed beginning on page 2:2 of this Calendar. Six OAC credits including English are required; some science or mathematics is recommended.

The Faculty of Environmental Studies expects that students enrolled in any of its programs should be able to demonstrate competence in writing. Accordingly, all students newly admitted to the Faculty (except those who have passed OAC 1 English with a final grade of 80% or higher) are required to write the English Language Proficiency Examination during their first term of registration (normally scheduled during registration week in September). The English Language Proficiency Program is recorded on the student’s academic record as Arts 000 Y. Because of the necessity of communicating research and project results, both in the program and in careers after graduation, writing skills are particularly important in Environment and Resource Studies.

Applicants who have been out of school for a number of years are considered on the basis of their work experiences and interests in environmental studies as well as their past academic record.

Most required courses are taken in the first two years. The first-year introductory courses examine major environmental themes from the viewpoints of the natural and social sciences. They also introduce techniques for investigating environmental questions and provide experience in conducting a systematic enquiry through the device of small group projects. In the second year, further work in natural ecology and social sciences helps to introduce other perspectives and themes running through environment and resource studies. Additional course work on research design, methodology, and information or data handling is required and each student also conducts an individual or group project selected from a wide range of possible topics and problem areas.

The core requirements for Years Three and Four are also project-oriented, comprising a “seminar-workshop” and Senior Honours assignment respectively. Arrangements to receive extra credit for project work have been provided for those who learn most effectively through undertaking self-directed work under the guidance of faculty and other advisors. The fourth year also requires participation in a Senior Honours Seminar course which provides the occasion for students to draw together what they have learned and direct it to one of the broad sub-areas within Environment and Resource Studies.

The emphasis given to project-oriented learning within the program reflects the importance attached to having students develop increasingly sophisticated abilities for coping with situations that are inherently complex, value-laden, ambiguous and uncertain. Project-oriented learning provides the occasion to practise skills in problem definition, information and data gathering, analysis and synthesis of material, and presentation of results in a suitable format using the most appropriate communications media. Skills of this nature can be
refined, adapted and applied in whatever context or situations students choose during and after their university years. An increasing number of students incorporate work with governmental agencies, community organizations and other groups into projects they select for their third- and fourth-year project assignments and, in a few cases, well-conceived and executed projects have led to employment in a variety of organizations.

Elective courses can be chosen from anywhere in the University and options start from the first year in the program. Faculty will advise on this, but essentially there are five possibilities, as follows:

1. The Honours Regular and Co-operative Programs
   Students take the required core program and whatever sets of elective courses they wish to round out their individual interests and skills.

2. Themes
   Students can specialize in one of three themes within the Department by taking the required core program and the identified electives for one of these themes.
   
a) Sustainable Environmental and Resource Systems
b) Environmental, Social and Technological Impact Analysis
c) Natural Area Management

3. A Joint Honours Degree
   Students can elect to take a Joint Honours degree with another department, which will require fulfilling the core program of a second department as well as Environment and Resource Studies.

4. A Minor
   Students can elect to take a Minor with another department, which requires completion of ten term courses in another department, as designated by that Department.

5. An Option
   Students can elect to take one of the recognized Options outside of the department involving choices among sets of courses all bearing on some theme or field of interest. See, for example: Society, Technology and Values (STV), Administration, Canadian Studies, Legal Studies, Management Studies, Peace and Conflict Studies. These are listed in the Calendar in Chapter 15, under "Interdisciplinary Programs".

6. Field Study Program (FSP)
   Since 1980, students have had several opportunities to study environment/development issues in India. The program consists of preparatory lectures, seminars and readings followed by approximately six weeks of study in India. Such Field Study Program opportunities in India and elsewhere will continue to be available to ERS students on an intermittent basis.

In each case students should give careful consideration to their choices in terms of the educational goals and possible careers they may wish to pursue after obtaining a BES degree. They would also do well to seek information and advice on the kind of undergraduate courses favoured by graduate programs in which they may be interested.

The recommended course load is five term courses per term. Each student must have completed 40 term courses or the equivalent before graduation with a cumulative overall average of 65.0; a cumulative average of 70.0 must be maintained in ERS ENV S courses. There are several evaluation techniques used to determine grades.

The Honours Regular Program

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<tr>
<th>Year One</th>
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<tbody>
<tr>
<td>ENV S 195</td>
<td>Introduction to Environmental Studies</td>
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<tr>
<td>ERS 100(F)</td>
<td>Issue Analysis and Problem-Solving 1</td>
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<tr>
<td>ERS 101(W)</td>
<td>Issue Analysis and Problem-Solving 2</td>
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<tr>
<td>ERS 150(F)</td>
<td>Environmental Methods &amp; Techniques</td>
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<tr>
<td>ENV S 178</td>
<td>Introduction to Environmental Research Methods</td>
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<td>plus electives for a total of five term courses for the Fall term and five term courses for the Winter term.</td>
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<th>Year Two</th>
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<tr>
<td>ENV S 200</td>
<td>Field Ecology</td>
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<tr>
<td>ERS 290/291</td>
<td>Seminar-Workshop</td>
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<tr>
<td>ERS 295</td>
<td>Development of Environmental Thought 1</td>
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<tr>
<td>plus electives for a total of five term courses for the Fall term and five term courses for the Winter term.</td>
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<td>Note that 200, and/or 295 may be taken in years other than Year Two.</td>
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<tr>
<td>ERS 390A/B</td>
<td>Seminar-Workshop (with consent of Faculty, 391A/B, may be taken in place of 390A/B.)</td>
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<tr>
<td>ERS 396</td>
<td>Development of Environmental Thought 2</td>
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<td>plus electives for a total of five term courses for the Fall term and five term courses for the Winter term.</td>
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Year Four
ERS 400 Senior Honours Seminar
ERS 490A/B Senior Honours Assignment (with consent of Faculty, 491A/B or 492A/B may be taken in place of 490A/B).

plus electives for a total of ten term courses for the Fall/Winter Session.

The Honours Co-operative Program
During the Winter term of Year One, those interested may apply to enter the Honours Co-operative program. The first work term would be in the Winter of second year. The remainder of the Co-operative program is as follows:

Term 2A
ENV S 200 Field Ecology
ERS 290 Seminar-Workshop
ERS 295 Development of Environmental Thought 1
plus electives for a total of five term courses. With consent of Undergraduate Officer, 200 may be taken in Term 3A or Term 3B.

Term 2B
ERS 291 Seminar-Workshop
plus electives for a total of five term courses.

Term 3A
ERS 390A Seminar-Workshop
ERS 396 Development of Environmental Thought 2
plus electives for a total of five term courses

Term 3B
ERS 390B Seminar-Workshop
plus electives for a total of five term courses.

Terms 4A/B
Same as regular program.

Note 1
The arrangement of academic and work terms, and further information on Co-operative study generally, are given in Chapter 5 of the Calendar.

THE THEME PROGRAMS

1. Sustainable Environmental and Resource Systems
This theme is intended to introduce students to the broad range of environmental, social, political and economic factors affecting the development and implementation of resource policy and management in Canada. A particular focus exists on the technical and economic potential for, impacts of, and implementation strategies for conservation alternatives. Other areas of interest include water and solid waste management.

2. Environmental, Social and Technological Impact Assessment
This theme prepares students to identify, analyse, manage and monitor the wide range of complex effects that human activities have on natural and social environments. This mix of skills and interests is referred to as technology, environmental or social impact assessment (TA/EIA/SIA).

3. Natural Area Management
This theme has been developed for students aspiring to be professional managers of natural areas, that is, parks, reserves or recreational areas that require protective management and/or sensitive uses of their major natural features.

Joint Honours Programs
Students may combine Environment and Resource Studies with another academic discipline to the extent that a Joint Honours degree can be awarded. Arrangements to do this have been approved with 13 other departments and more are being considered. Students interested in Joint Honours should consult with the Undergraduate Officer.

Minors
Consult page 11.6 of the calendar.

Options
Consult Chapter 15 of this Calendar for information on Interdisciplinary Programs.

Department of Geography

Nature of the Program
Geography is concerned with both the natural and human environment, studying how it has been shaped according to human need, how patterns of human activities are structured over space, and how these are influenced by environmental factors. Geography is considered both a natural and social science and flourishes in an academic organization where the multi-disciplinary approach is emphasized. The Bachelor of Environmental Studies (BES) programs in Geography (Honours and General) provide students with considerable freedom to choose supporting electives from any department in the University. Students can develop programs to suit their particular interests. Joint Honours programs with a number of other departments are listed on page 11:18.

The four-year Geography programs provide a sound, foundation in the discipline, and prepare the student for specialization at the graduate level in almost any aspect of Geography. The mandatory content courses include a series of integrated courses in both physical and human geography. In the Honours program, the fourth year includes a research project, either the Senior Honours Thesis or the Senior Research Paper.
Although the four-year programs are broad in scope, students may concentrate their courses in one or more of the major areas of specialization available in the Department (page 11:15). Students are also encouraged to consider a broadly based program without specialization.

The Honours Co-op program provides for alternate terms of practical work experience and academic study. Students may be admitted to the Co-op program in the first or second year. The first work term is in the Winter of the second year.

Co-op Geography students must normally follow the work and study-term sequence outlined on page 11:18. A work-term report is required upon completion of each work term and four of these must be approved for the Co-op degree. Inquiries for additional information regarding Co-operative studies should be directed to the Co-op Undergraduate Officer.

The three-year General Geography program provides a liberal education in environmental studies, with less specialization in Geography than in the four-year programs. This program can also be completed by correspondence. In addition to the BES (Bachelor of Environmental Studies) program in Geography a BA (Bachelor of Arts) degree program is also available in Geography (page 9:23).

In all programs there is emphasis on the development of both theory and methodology and on the practical application of geographical concepts to the economic, social and political problems of Canada and other parts of the world. The "applied geography" aspects of the program are enhanced by the availability in the Faculty of elective courses in Architecture, Urban and Regional Planning and Environment and Resource Studies. Graduating students acquire a variety of jobs in education, government, industry and planning agencies; more information on employment possibilities is provided in a Department of Geography publication, Jobs in Geography.

The Department of Geography offers both Master's (MA) and Doctoral (PhD) graduate programs. At the graduate level course work and research are concentrated on a specific subfield of Geography. Areas of research specialization include applied physical geography, cartography, air photo interpretation and remote sensing, urban and economic geography, agricultural geography and rural development, regional planning and development, resources management, Canada and Europe.

BACHELOR OF ENVIRONMENTAL STUDIES

(Geography Program)

A) THREE YEAR PROGRAM

Year One
GEOG 101 Introduction to Human Geography
GEOG 102 Introduction to Physical Geography

GEOG 160 Introduction to Cartography and Map Analysis

Electives: (see notes below)

Year Two
ENV S 200 Field Ecology
GEOG 201 Geomorphology and Soils
GEOG 202A Location of Economic Activities

One of:
GEOG 208 Applied Climatology
GEOG 309 Physical Climatology

One of:
GEOG 204 Soviet Union
GEOG 205 Africa
GEOG 206 The World Region and World Issues
GEOG 221 The United States
GEOG 226 Food, Agriculture and Integrated Rural Development in the Third World
GEOG 227 Regional Problems of Europe

and additional courses so that a student should have completed by the end of the second year 20 term courses. One of these term courses should be ENGL 109, 129R, 140R, 150 taken in Year One or ENGL 209, 210A, 210C taken in Year Two. A term course in English is a requirement.

Year Three
GEOG 381 The Nature of Geography

Additional courses so that a student will have completed at least 30 term courses.

Notes on Three Year Program

1. Minimum Required Credits
   Total: 30 term courses. Geography: 12 term courses. Outside of Faculty of Environmental Studies: eight term courses. All Environmental Studies courses are included in the cumulative Geography average but only four can be counted in meeting the minimum required credits of Geography courses.

2. Term Course Load
   No more than five courses may be taken in a term without the approval of the Associate Chair (Undergraduate Studies). Normally, approval for a sixth course will be considered only if the cumulative Geography average is B+ or higher.

3. Average Requirements
   Students must maintain an overall cumulative average of 60% and a Major cumulative average of 65%. All required courses must be passed.

4. First-Year Term Courses
   For a three-year General degree, a student must have at least 17 term courses above the 100-level.

5. Other Comments
   See notes 4, 5 and 6 on four-year programs.
B) FOUR-YEAR PROGRAMS (HONOURS REGULAR AND CO-OP. GENERAL)

Note
Students admitted after the Fall of 1989 will no longer be able to enrol in the Four-Year General Geography program.

Year One
GEOG 101 Introduction to Human Geography
GEOG 102 Introduction to Physical Geography
GEOG 160 Introduction to Cartography and Map Analysis
ENV S 178 Introduction to Environmental Research Methods

Electives including Geography and a term course in English, either one of ENGL 109, 129R, 140R, 150 taken in Year One or ENGL 209, 210A, 210C taken in Year Two. A term course in English is a requirement.

Year Two
ENV S 200 Field Ecology
GEOG 201 Geomorphology and Soils
GEOG 202A Location of Economic Activities
GEOG 202B The Geography of Economic Development (Honours students only)
GEOG 275 Introductory Air Photo Analysis and Remote Sensing
ENV S 278 Advanced Environmental Research Methods

One of:
GEOG 208 Applied Climatology
GEOG 309 Physical Climatology

One of:
GEOG 204 Soviet Union
GEOG 205 Africa
GEOG 206 The World Region and World Issues
GEOG 221 The United States
GEOG 220 Food, Agriculture and Integrated Rural Development in the Third World
GEOG 227 Regional Problems of Europe

If desired, two of the required courses above may be taken in Year Three.

Electives: see notes below.

Year Three
GEOG 381 The Nature of Geography
GEOG 390 Senior Honours Thesis Proposal
GEOG 391 Field Research (not required for Co-op)

Electives: see notes below.

Year Four
Honours students take:
GEOG 490A/B Senior Honours Thesis
or GEOG 491A/B Senior Research Paper

All students choose:
Electives to fulfill degree requirements.
(See notes below).

Notes on Four-Year Programs

1. Minimum Required Credits
Total: 40 term courses. Geography: 20 term courses. All term courses for which 1.0 credit is awarded will count as the equivalent of two term courses. Outside of Faculty of Environmental Studies: ten term courses. Only four term courses designated Environmental Studies may be counted as Geography courses but all courses designated Environmental Studies are included in the cumulative Geography average.

2. Term Course Load
No more than five courses may be taken in a term without the approval of the Associate Chair (Undergraduate Studies). Normally, approval for a sixth course will be considered only if the cumulative Geography average is B+ or higher.

3. Average Requirements
Students in the General program must maintain an overall cumulative average of 60.0, and a Major cumulative average of 65.0. Students in the Honours programs must maintain an overall cumulative average of 85.0 and a Major cumulative average of 70.0. All required courses must be passed.

4. Secondary School Teaching
Students intending to teach in Secondary Schools should take at least four term courses of Regional Geography and at least four term courses in another teachable school subject.

5. Materials and Costs
For some courses, extra fees may be required to defray heavy equipment/ travel costs, e.g. GEOG 391 (Field Research). Statements on extra costs, where required, will be found with the course description.

6. Independent Study
Up to three independent study courses (GEOG 475A, B, C) may be taken. These can be taken in different terms or concentrated in Fall term, Year Three as part of an independent study term comprising GEOG 390, GEOG 391 and GEOG 475A, B, C. Such a program must be arranged with the Associate Chair (Undergraduate Studies) and the faculty members involved.

7. Honours Co-operative Program
Students are admitted to the Co-op program in either first or second year and enter their first work term in the Winter of the second year. The Honours Co-op program has the same academic requirements as the Honours Regular program.
8. Four-Year General Program

After the Fall of 1989, the four-year General program will no longer be available. Students who are currently registered in this program may complete their degrees but new admissions or transfers to the four-year General program will not be permitted. Course requirements for the four-year General program are the same as for Honours except that General students substitute Geography electives for GEOG 390, GEOG 490A/B and GEOG 491A/B.

9. First-Year Term Courses

For a four-year Honours degree a student must have at least 27 term courses above the 100-level.

Co-op Course Scheduling Recommendations

Year One
GEOG 101, 102, 160
ENV S 178

Year Two
Fall Term 2A
ENV S 200 and 278
One of: GEOG 208, 309
Electives, one of which must be ENGL 109, 129R, 140R, 150 taken in Year One or ENGL 209,210A, 210C preferably taken in Spring term 2B

Winter Work Term 1

Spring Term 2B
GEOG 201, 202A, and one of: 204, 205, 206, 221, 226, 227.
Electives

Fall Work Term 2

Year Three
Winter Term 3A
GEOG 202B, 381
Electives

Fall Term 3B
GEOG 390
Electives

Year Four
Winter Work Term 4
GEOG 490A or 491A
Electives

Spring Term 4A
Fall Work Term 5

Winter Term 4B
GEOG 490B or 491B

Joint Honours Programs

Joint Honours programs have been arranged between Geography and other disciplines in the University. Detailed programs have been worked out with Anthropology, Biology, Earth Sciences, Economics, English, Environment and Resource Studies, French, German, History, Management Studies, Mathematics, Music, Political Science, Psychology, Recreation, Russian, and Sociology. The program "Geography with Canadian Studies," is not a Joint Honours program but an Option. These programs lead to degrees in the Faculty in which the student is registered.

The Department of Geography is prepared to work out other programs not listed for Honours students. Geography core requirements in Joint programs are similar to those of the Geography Honours program but equivalent courses in the home department to ENV S 178,278 and GEOG 390 and GLOG 490A, 490B, 491A, 491B are accepted. Required courses are GEOG 101, 102, 160, 201, 202A, 202B, 208 or 309, 275, a 200-level Regional course (see page 11:20), 381 and ENV S 200. If scheduling difficulties arise in meeting required courses, contact the Associate Chair (Undergraduate Studies) in Geography for possible substitute courses.

Notes on Joint Honours Programs

1. Number of Credits

The minimum number of term courses in Geography/Environmental Studies for students registered in Joint Honours programs is 14.

2. Average Requirements

Geography students taking Joint Honours with another Department must achieve Honours standing as required by the Geography Department (65.0% overall, 70.0% in Geography). The average required in the second major is the minimum Honours standing set by that Department. Students in other Departments taking Joint Honours with Geography must achieve a cumulative average of 70.0% in Geography and Environmental Studies courses. Courses designated as "Environmental Studies" are included with Geography courses in the calculation of the Geography average.

3. Canadian Studies

Students choosing the program Geography with Canadian Studies are referred to the regulations of that program. In addition, the Department of Geography recommends that course selections include at least six courses from those listed for Areas of Specialization under Canadian Geography (see page 11:19).

AREAS OF SPECIALIZATION

Listed below are elective second-, third- and fourth-year courses in Geography and other relevant courses in the Department's major areas of specialization. This is not a definitive list; students are encouraged to seek out other specialized courses that meet their needs.

Applied Physical Geography
GEOG 300  Geomorphology and the Southern Ontario Environment
GEOG 302  Geomorphological Processes
Environmental Studies
Geography

GEOG 303  Geographical Hydrology
GEOG 304  Field and Laboratory Techniques in Geomorphology
GEOG 309  Physical Climatology
GEOG 400  Climatic and Periglacial Morphology
GEOG 401  Glacial Geomorphology and Contemporary Applications
GEOG 408  Atmospheric Resource Analysis
GEOG 409  Energy Balance Climatology
GEOG 451  Soils Geography
GEOG 461  Land Dereliction and Rehabilitation 1
GEOG 462  Land Dereliction and Rehabilitation 2
ARCH 124  An Introduction to Landscape Design
BIOL 250  Ecology
CIV E 353  Geotechnical Engineering 1
CIV E 493  Engineering in the Canadian North
EARTH 260  Applied Geophysics 1
EARTH 342  Applied Geomorphology
EARTH 370  Earth Resources
EARTH 438  Engineering Geology
EARTH 440  Quaternary Geology
EARTH 441  Introductory Quaternary Ecology
EARTH 458  Physical Hydrogeology
EARTH 459  Chemical Hydrogeology
SCI 220  Chemistry of Pollution
SCI 250  Environmental Geology
SCI 453  Marine Ecosystems and the Human Impact
SCI 454  Biology of Freshwater Pollution

Canadian Geography
GEOG 300  Geomorphology, Southern Ontario Environment
GEOG 309  Physical Climatology
GEOG 311  Regional and Local Development
GEOG 315  Agricultural Geography
GEOG 322  Geographical Study of Canada
GEOG 352  The Rural-Urban Fringe
GEOG 359  Geography of Energy
GEOG 422  Canada

plus other Canadian Content Courses (page 15/4).

Environmental and Resources Management
GEOG 303  Geographical Hydrology
GEOG 315  Agricultural Geography
GEOG 323  Perspectives on International Tourism
GEOG 333  Recreation Geography
GEOG 352  The Rural-Urban Fringe
GEOG 356  Resources Management
GEOG 358  Water Planning and Management
GEOG 359  Geography of Energy
GEOG 367  Conservation in Wildland and Resource Management
GEOG 368  Conservation/Resource Management of the Built Environment
GEOG 408  Atmospheric Resource Analysis

GEOG 461  Land Dereliction and Rehabilitation 1
GEOG 462  Land Dereliction and Rehabilitation 2
ANTH 330  Cultural Ecology
CIV E 344  Urban Transport Planning
CIV E 381  Hydraulics
CIV E 480  Water Resources Management
CIV E 486  Hydrology
EARTH 370  Earth Resources
FCON 355  Economics of Energy and Natural Resources
ECON 361  Cost Benefit Analysis and Project Evaluation
ENV S 201  Introduction to Environmental and Planning Law
ENV S 220  Environmental Economics
ENV S 320  Environmental Economics: An Historical Perspective
ENV S 401  Environmental Law
ENV S 417  Field Studies in Land Use History and Landscape Change
ENV S 433  People in Natural Areas
ENV S 500  Professional Development in Environmental Management
ERS 218  Introduction to Sustainable Environmental and Resource Systems
ERS 241  Introduction to Environmental and Social Impact Assessment
ERS 318  Case Studies in Sustainable Environmental and Resource Systems
ERS 351  Organizations and Environmental Management
ERS 418  Seminar On Strategies For Sustainable Development
PLAN 255  Planning Surveys and Analyses
PLAN 402  Planning Law
REC 201  Sociology of Leisure
REC 230  Outdoor Recreation Resources Management
REC 280  Travel and Tourism
REC 331  Outdoor Education
REC 334  Park Management
REC 432  Visitor Management and Interpretation
REC 434  Advanced Park Planning and Management
REC 435  Recreation Resource Policy
SCI 250  Environmental Geology
SCI 453  Marine Ecosystems and the Human Impact
SCI 454  Biology of Freshwater Pollution
SOC 286  Environment and Behaviour
SOC 347  Sociology of Leisure

Regional Development
GEOG 311  Regional and Local Development
GEOG 315  Agricultural Geography
GEOG 319  Economic and Social Techniques for Regional Planning
GEOG 350  Regional Urban Systems
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECON 333</td>
<td>Interregional Economics</td>
</tr>
<tr>
<td>ECON 335</td>
<td>Economic Development</td>
</tr>
<tr>
<td>ECON 361</td>
<td>Cost Benefit Analysis and Project Evaluation</td>
</tr>
<tr>
<td>ECON 365</td>
<td>Economic Development of Modern Europe 1760-1973</td>
</tr>
<tr>
<td>M SCI 261</td>
<td>Managerial and Engineering Economics 1</td>
</tr>
<tr>
<td>M SCI 461</td>
<td>Managerial and Engineering Economics 2</td>
</tr>
<tr>
<td>PLAN 232</td>
<td>Rural Planning and Development</td>
</tr>
<tr>
<td>PLAN 259</td>
<td>Regional Planning and Economic Development</td>
</tr>
<tr>
<td>PLAN 360</td>
<td>Technology in Urban and Regional Planning</td>
</tr>
<tr>
<td>PLAN 370</td>
<td>Land Development Planning</td>
</tr>
<tr>
<td>PSCI 343</td>
<td>Canadian Municipal Government</td>
</tr>
<tr>
<td>PSCI 344</td>
<td>The Politics of Local Government</td>
</tr>
<tr>
<td>REC 280</td>
<td>Travel and Tourism</td>
</tr>
<tr>
<td>SOC 256</td>
<td>Ethnic and Racial Relations</td>
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</tbody>
</table>

**Regional Geography**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOG 204</td>
<td>Soviet Union</td>
</tr>
<tr>
<td>GEOG 205</td>
<td>Africa</td>
</tr>
<tr>
<td>GEOG 206</td>
<td>The World Region and World Issues</td>
</tr>
<tr>
<td>GEOG 221</td>
<td>The United States</td>
</tr>
<tr>
<td>GEOG 225</td>
<td>Urbanization in the Third World</td>
</tr>
<tr>
<td>GEOG 226</td>
<td>Food, Agriculture, and Integrated Rural Development in the Third World</td>
</tr>
<tr>
<td>GEOG 227</td>
<td>Regional Problems of Europe</td>
</tr>
<tr>
<td>GEOG 320</td>
<td>Regional Geography</td>
</tr>
<tr>
<td>GEOG 322</td>
<td>Geographical Study of Canada</td>
</tr>
<tr>
<td>GEOG 323</td>
<td>Perspectives on International Tourism</td>
</tr>
<tr>
<td>GEOG 326</td>
<td>Gender Roles and Development Alternatives in the Third World</td>
</tr>
<tr>
<td>GEOG 332</td>
<td>Topics in Population Geography: Health and Disease</td>
</tr>
<tr>
<td>GEOG 421A/B</td>
<td>Western Europe 1/2</td>
</tr>
<tr>
<td>GEOG 422</td>
<td>Canada</td>
</tr>
<tr>
<td>GEOG 423</td>
<td>Central and Eastern Europe</td>
</tr>
<tr>
<td>GEOG 424</td>
<td>Soviet Union</td>
</tr>
<tr>
<td>GEOG 425</td>
<td>Africa</td>
</tr>
<tr>
<td>GEOG 430A/B/C</td>
<td>Field Research in Regional Geography</td>
</tr>
<tr>
<td>SOC 252</td>
<td>Migration and Society</td>
</tr>
</tbody>
</table>

**Methods and Techniques**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
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<tbody>
<tr>
<td>GEOG 307</td>
<td>Social Survey Techniques</td>
</tr>
<tr>
<td>GEOG 316</td>
<td>Multivariate Statistics</td>
</tr>
<tr>
<td>GEOG 317</td>
<td>Nonparametric Statistics</td>
</tr>
<tr>
<td>GEOG 318</td>
<td>Spatial Analysis</td>
</tr>
<tr>
<td>GEOG 319</td>
<td>Economical and Social Techniques for Regional Planning</td>
</tr>
<tr>
<td>GEOG 360</td>
<td>Preparation of Maps and Illustrations</td>
</tr>
<tr>
<td>GEOG 375</td>
<td>Air Photo Interpretation</td>
</tr>
<tr>
<td>GEOG 376</td>
<td>Environmental Remote Sensing</td>
</tr>
<tr>
<td>GEOG 403</td>
<td>Computer Assisted Cartography</td>
</tr>
<tr>
<td>GEOG 404</td>
<td>Cartographic Production and Design</td>
</tr>
<tr>
<td>GEOG 407</td>
<td>Field and Lab Techniques in Geomorphology</td>
</tr>
<tr>
<td>GEOG 470</td>
<td>Applied Air Photo Interpretation</td>
</tr>
<tr>
<td>GEOG 471</td>
<td>Advanced Remote Sensing</td>
</tr>
<tr>
<td>ECON 321</td>
<td>Introduction to Econometrics</td>
</tr>
<tr>
<td>ENV S 252</td>
<td>Media Tools for Environmental Studies</td>
</tr>
<tr>
<td>ENV S 378</td>
<td>Applications of Computer Programming in Environmental Studies</td>
</tr>
<tr>
<td>ERS 241</td>
<td>Introduction to Environmental and Social Impact Assessment</td>
</tr>
<tr>
<td>PLAN 265</td>
<td>Planning Surveys and Analysis</td>
</tr>
</tbody>
</table>

**Urban-Economic Geography**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOG 311</td>
<td>Regional and Local Development</td>
</tr>
<tr>
<td>GEOG 315</td>
<td>Agricultural Geography</td>
</tr>
<tr>
<td>GEOG 349</td>
<td>The City as a System</td>
</tr>
<tr>
<td>GEOG 350</td>
<td>Regional Urban Systems</td>
</tr>
<tr>
<td>GEOG 351</td>
<td>Geography of Transportation</td>
</tr>
<tr>
<td>GEOG 352</td>
<td>The Rural-Urban Fringe</td>
</tr>
<tr>
<td>GEOG 359</td>
<td>Geography of Energy</td>
</tr>
<tr>
<td>GEOG 411</td>
<td>Geography of Manufacturing Firms and Industries</td>
</tr>
<tr>
<td>GEOG 448</td>
<td>Urban Historical Geography</td>
</tr>
<tr>
<td>GEOG 450</td>
<td>City and Regional Systems</td>
</tr>
<tr>
<td>CIV E 342</td>
<td>Transport Principles and Applications</td>
</tr>
<tr>
<td>CIV E 343</td>
<td>Traffic Engineering</td>
</tr>
<tr>
<td>CIV E 344</td>
<td>Urban Transport Planning</td>
</tr>
<tr>
<td>ECON 231</td>
<td>Introduction to International Economics</td>
</tr>
<tr>
<td>ECON 343</td>
<td>Urban Economics</td>
</tr>
<tr>
<td>ECON 345</td>
<td>Industrial Organization</td>
</tr>
<tr>
<td>ENV S 201</td>
<td>Introduction to Environmental and Planning Law</td>
</tr>
<tr>
<td>PLAN 330</td>
<td>Urban Social Planning</td>
</tr>
<tr>
<td>PLAN 370</td>
<td>Land Development Planning</td>
</tr>
<tr>
<td>PLAN 402</td>
<td>Planning Law</td>
</tr>
</tbody>
</table>

**GEOGRAPHY MINOR FOR HONOURS STUDENTS IN OTHER DEPARTMENTS**

Any ten term courses in Geography among which can be included ENV S 195 and ENV S 200.

Students wishing to concentrate on a particular world region should choose relevant courses from history, other social sciences and the languages. Students concentrating on Canada should consider doing the Option, Geography with Canadian Studies (see page 11.18).
School of Urban and Regional Planning

Bachelor of Environmental Studies (Honours Urban and Regional Planning Program)

Nature of the Program
The emphasis of the program is on planning as a process, conceived in broad terms to include policy making, research and decision making. The subject focus is regional; that is, the integrated planning of regions, large and small. It includes urban-centred or core regions and rural components in which the policy emphasis is on environmental issues and other contexts typical of the Canadian scene, in which resource potentials are not yet realized, and where development issues and problems of human adjustment are in the forefront.

To implement this approach, the School of Urban and Regional Planning has gathered a team of Faculty with diverse academic and practical planning experience.

The broad aim of the School is to prepare the student for active participation in the planning process. This approach gives equal emphasis to the 'why' and 'how' of planning and requires that a style be adopted that strives for a continuum between classroom and field experience, between planning studies and related disciplines, and between academic studies and future professional practice. Realizing this concept requires integration within the program of selected elements from Geography, social sciences and pure and applied sciences. For this purpose, the School of Urban and Regional Planning has been located in a Faculty with an interdisciplinary approach to a wide range of environmental issues.

The program gives a well-rounded preparation for a wide variety of professional or graduate work in urban planning, regional planning and resource development. Courses on the theory, methods and philosophy of planning provide an integrating framework. The student is also given an opportunity to pursue a special interest in economic, social, and ecological issues in planning, or in planning methodology. This is done through the selection of elective courses. Students are also encouraged to select Senior Honours Essay Topics from these special fields of interest.

The integration of practical work experience into the program is considered an important part of the educational process. Students will be brought into direct contact with the profession and will be exposed to problems typical of those encountered in practice, as well as being introduced to projects and operations beyond the scope of any university laboratory.

The Honours Co-operative program provides for alternative terms of practical work experience and academic study. Students are admitted to this stream at the beginning of their second term of Year Two on the basis of academic standing and interviews. The first work term is in the Spring following completion of second year. Co-op students normally follow the work and study-term sequence outlined on page 10:23. A work-term report is required upon completion of each work term and four of these must be graded as "satisfactory" in order to graduate.

Inquiries regarding Co-operative studies should be directed to the School's Co-op Program Coordinator, or the Department of Co-operative Education and Career Services.

The Regular program encourages students to actively seek work experience (Internship) during the summer months of their second and third years.

Because of the importance of effective communication, an OAC English is required. Incoming students are expected to demonstrate proficiency in written English through the English Language Proficiency Examination (ELPE) offered by the English Department at the start of the fall term. Students who have a final grade of 80% or higher in English OAC 1 are exempt from writing the ELPE. If necessary, students will take the appropriate remedial work in addition to normal course and credit requirements. With an increased emphasis in the profession on quantitative techniques, students are encouraged to take at least one Ontario Academic Course credit in Mathematics. Students with deficiencies in these areas can elect to take equivalent or remedial courses in their first year of the program.

Additional Information
The Planning programs are recognized by the Canadian Institute of Planners and an increasing number of employers as a satisfactory preparation for a wide range of careers.

Notes
1. Academic Standing
Students must obtain a minimum average of 65% in the overall average and 70% in the major average (Planning and Environmental Studies courses) throughout the four years of their program. In order to proceed to subsequent years, students must also obtain minimum credits and term courses as follows:
   - Year One – five credits (ten term courses);
   - Year Two – ten credits (20 term courses);
   - Year Three – 15 credits (30 term courses);
   - Year Four – 20 credits (40 term courses).

   Students may be granted conditional or probationary standing at the discretion of the School, which permits a student to proceed to a subsequent year on a probationary or conditional basis. Should the student be permitted to continue on the basis of "conditional" due to average and/or course credit standing, and if subsequently the required averages are not met this second time, or credit deficiencies not cleared, withdrawal from the program will be required.

2. Course Loads and Sequencing
Year One students must select courses from first-year level only. Students in the Planning School are expected to carry a minimum load of ten term courses
in each of the four years of the program. However, students interested in taking extra courses are free to take a six term course load in any given term without approval from the School; preregistration for more than six term courses may only be done with the Undergraduate Officer's approval.

3. First-Year Term Courses

No more than 12 term courses (six credits) at the first-year level will be allowed toward the 40 required to graduate (20 credits).

4. Admission to Year 2

To enter Year Two of Urban and Regional Planning from Year One, a student must obtain a minimum cumulative overall average of 65.0 and 70.0 in Planning and Environmental Studies courses and must obtain credit standing in ten term courses. In subsequent years, a student must maintain a cumulative overall average of 65.0 and 70.0 in Planning and Environmental Studies courses, as well as obtain credit standing in an additional ten term courses each year of the program.

It is possible for non-Planning students to gain admission to Year Two. Advanced standing may be obtained through the transfer of credits from other programs and institutions. However, advanced standing will not be granted to transfer students beyond the Year One level (ten term course credits). All transfer students are required to complete a minimum of three full academic years in the program (Years Two - Four) before being eligible for graduation.

All students admitted to the program with advanced standing must have their program for each year approved by the Admissions Officer.

5. Joint Honours and Minors

Although the School does not share in Joint Honours programs, Planning students are encouraged to participate in the Minors offered by other Departments. Students choosing Minors (in such programs as Canadian Studies, Political Science, and Management Studies) are referred to the regulations of those programs. See other faculty and department sections in this Calendar regarding Minors available.

6. The School reserves the right to make changes to the curriculum as necessary. Please consult the School prior to registration.


A number of important program guidelines and regulations are covered in the Undergraduate Studies Policy Manual available from the Secretary to the Undergraduate Officer. Policy areas covered include: Admission, Courses, Examinations, English Language Proficiency Requirement, Records and Transfers, Registration, Appeals and Discipline, Academic Standing, Senior Honours Essay, and Leave of Absence. Students are expected to refer to this manual in all matters concerning academic conduct.

Co-op Course Scheduling and Sequencing

<table>
<thead>
<tr>
<th>Year One</th>
<th>Arts 000, Plan 100 A and B, Plan 159, Plan 130 Electives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year Two</td>
<td>Fall Term 2A ENV S 200, Plan 256A, ENV S 278 Electives</td>
</tr>
<tr>
<td>Winter Term 2B PLAN 255, PLAN 256B, ENV S 201 Electives</td>
<td></td>
</tr>
<tr>
<td>Spring Work Term 1</td>
<td></td>
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<tr>
<td>Year Three</td>
<td>Fall Term 3A PLAN 300A, PLAN 307 Electives</td>
</tr>
<tr>
<td>Winter Work Term 2</td>
<td></td>
</tr>
<tr>
<td>Spring Term 3B PLAN 300B, PLAN 330, PLAN 390 Electives</td>
<td></td>
</tr>
<tr>
<td>Year Four</td>
<td>Fall Work Term 3</td>
</tr>
<tr>
<td>Winter Term 4A PLAN 456A, PLAN 480A, PLAN 490A Electives</td>
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</tr>
<tr>
<td>Spring Work Term 4</td>
<td></td>
</tr>
<tr>
<td>Fall Term 4B PLAN 456B, PLAN 480B, PLAN 490B Electives</td>
<td></td>
</tr>
</tbody>
</table>

For complete listing of electives, see Department Undergraduate Manual.
### HONOURS URBAN AND REGIONAL PLANNING RECOMMENDED PROGRAM (REGULAR AND CO-OP)

<table>
<thead>
<tr>
<th>YEAR</th>
<th>Required Core Planning Courses</th>
<th>Required Theme Elective Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>ONE</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Year One Required Theme Elective Courses**

**Theme Areas:**

1. **BIOPHYSICAL**
2. **ECONOMIC THEME**
3. **POLITICS THEME**
4. **PHILOSOPHY & ARTS THEME**
5. **METHODS THEME**
6. **GENERAL THEME**

For a listing of the courses included under each Theme Area, see the current School Undergraduate Manual.

**Note:** Required core and elective courses together will total ten term courses — all courses to be at First-Year level.

<table>
<thead>
<tr>
<th>YEAR</th>
<th>Required Core Planning Courses</th>
<th>Required Theme Elective Courses</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>TWO</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

**Year Two Required Theme Elective Courses**

**Theme Areas:**

1. **URBAN THEME**
2. **REGIONAL THEME**
3. **RURAL/RESOURCE THEME**
4. **GENERAL THEMES**

For a listing of the courses included under each Theme Area, see the current School Undergraduate Manual.

**Note:** Required core and elective courses together will total ten term courses.
### Year Three Required Core Planning Courses

<table>
<thead>
<tr>
<th>Required Core Planning Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLAN 300A Seminar/Workshop Project in Urban and Regional Planning 1.</td>
</tr>
<tr>
<td>PLAN 300B Seminar/ Workshop Project in Urban and Regional Planning 2.</td>
</tr>
<tr>
<td>PLAN 307 Social Survey Techniques in Planning,</td>
</tr>
<tr>
<td>PLAN 390 Senior Honours Essay Proposal (no credit weighting).</td>
</tr>
</tbody>
</table>

### Required Theme Elective Courses

| Three term courses from list of Third Year Required Theme Areas (see below). |
| Recommended Major Theme courses are: PLAN 301, 330, 359, 367, 368 |

### Other

| Three term courses from University offerings (as free electives). |

#### Year Three Required Theme Elective Courses

**Theme Areas:**

1. **URBAN THEME**
2. **REGIONAL THEME**
3. **RURAL/RESOURCE THEME**
4. **GENERAL THEMES**

For a listing of the courses included under each Theme Area, see the current School Undergraduate Manual.

**Note:** Required core and elective courses together will total ten term courses.

### Year Four Required Core Planning Courses

<table>
<thead>
<tr>
<th>Required Core Planning Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLAN 456A Political and Administrative Processes in Urban and Regional Planning 1,</td>
</tr>
<tr>
<td>PLAN 456B Political and Administrative Processes in Urban and Regional Planning 2,</td>
</tr>
<tr>
<td>PLAN 480A The Philosophy and Methodology of Urban and Regional Planning 1,</td>
</tr>
<tr>
<td>PLAN 480B The Philosophy and Methodology of Urban and Regional Planning 2,</td>
</tr>
<tr>
<td>PLAN 490A/PLAN 490B Senior Honours Essay.</td>
</tr>
</tbody>
</table>

### Required Theme Elective Courses

| Two term courses from list of Fourth Year Required Theme Areas (see below). |

### Other

| One term course from University offerings (as free elective). |

#### Year Four Required Theme Elective Courses

**Theme Areas:**

1. **URBAN THEME**
2. **REGIONAL THEME**
3. **RURAL/RESOURCE THEME**
4. **GENERAL THEMES**

For a listing of the courses included under each Theme Area, see the current School Undergraduate Manual.

**Note:** Required core and elective courses together will total ten term courses.
The Independent Studies Program Academic Advisor chats with an undergraduate student.
Independent Studies

Independent Studies is a small undergraduate degree program which emphasizes individualized programs of study. Students in the program have the opportunity to determine the goals and methods of their studies. Methods can take the form of independent library or laboratory research, group discussions, seminars, courses, and/or field placement. Areas of study can include any of the humanities, fine and performing arts, social sciences, environmental sciences, health sciences, science, and mathematics, or applications of these areas where the University of Waterloo has faculty expertise to assist students.

Independent Studies students are encouraged to explore a variety of interests and develop a perspective beyond that of a single discipline. Similarly, students are encouraged to explore a number of methods which may provide a depth of perspective on a specific area.

Most credit courses offered at the University of Waterloo are available to Independent Studies students. However, students are encouraged to tailor their programs to their learning needs which for some may mean taking few if any courses.

The ability to ask a meaningful question, obtain information related to that question, synthesize that information, and communicate conclusions, are important life-long learning skills that are central to Independent Studies and are also valued by employers.

Degree

The degree Bachelor of Independent Studies (BIS) is awarded by the University upon successful completion of the degree program described under Independent Studies Program.

Admission

General Requirements

The admission requirements of Independent Studies are the same as the minimum General Admission Requirements of the University for full-time study. In addition to these requirements, students must have the academic potential and motivation to work independently. Admission is determined by an Admission Committee which interviews applicants.

1. Academic Potential

Students must be able to do academic work at university level. Evidence of academic ability may be demonstrated by one or more of the following:

a. The completion of the Ontario Secondary School Diploma (OSSD) including a minimum of six Ontario Academic Course (OAC) credits or the equivalent (refer to Chapter 2 for details on admission categories, requirements, and procedures);

b. The successful completion of some university-level courses;

c. Written information from a teacher or professor attesting to this;

d. Other evidence such as independent scholarly work.

2. Motivation

Students must be so motivated that they can pursue their academic work independently. The committee would like evidence that an applicant has worked on his or her own projects outside of regular work or studies (i.e. started own business, built own computer, prepared original reports). Letters attesting to this motivation are important and should be specific, giving examples of projects undertaken.

Advanced Standing

If a student is transferring from another university or other post-secondary program or coming back to university as a mature student with some post-secondary academic background, prior credits obtained may reduce the time of enrollment required in I.S. to a minimum of four terms.

Independent Studies Program

The Independent Studies Program is divided into two phases: the Pre-Degree Phase and the Degree Phase.

1. Pre-Degree Phase

New students in Independent Studies (I.S.) begin by developing a study plan with the assistance of faculty members in I.S. This study plan focuses on expectations and objectives of a student's academic activities in the Program and establishes the habit of setting specific goals which provide structure for independent study. Each student during each pre-degree term will meet at least five times with two I.S. faculty members to discuss his or her academic work.

A study plan (Term Plan) is required of every student at the beginning of each term during the pre-degree phase of the program. A complete record of academic work accomplished during each term (Term Performance Report) must be submitted at the end of each term. These documents of work completed in the Pre-Degree Phase of the Program provide the basis for review and evaluation.

Students must spend at least two terms in this first phase if they have already completed two terms of university work, or at least four terms (of a possible six) if they have not previously attended university. While students in Pre-Degree Phase may take regular university courses, they are expected to engage in a significant amount of independent study and are encouraged to develop a perspective beyond that of an individual discipline.
2. Degree Phase

The Bachelor of Independent Studies degree (BIS) is recommended to Senate by the Academic Board of Independent Studies. The Board is composed of faculty members drawn from the disciplines represented on the University of Waterloo campus. The Board is assisted in its assessment of each degree candidate by a committee of supervisors, appointed by the Board to advise and evaluate the students during the Degree Phase.

Students may make application to the Academic Board for entry into the Degree Phase of the program after successfully completing a minimum of two terms in Independent Studies and at least four terms of post-secondary university work. Applicants must submit, in writing, a degree proposal which details their post-secondary academic history, the proposed program of study and a timetable for completion. This document is prepared in consultation with the proposed academic supervisors who must approve the degree proposal before it is submitted to the Academic Board, and with advice from the Contact Person appointed from the Academic Board.

The decision to accept an applicant for degree candidacy is based on an assessment of (a) the applicant's general preparedness for BIS degree level studies, that is to do at least third-year undergraduate work, and (b) the suitability of the degree studies proposal with respect to academic level and the University's capability to support such studies and examine the resulting work.

On acceptance of a student to degree candidacy, the Board formally appoints the academic supervisors (degree committee) including at least two members of the University of Waterloo's regular faculty. Over a period of at least eight months, the student meets regularly with the supervisors to carry out the approved program. When the work is completed, the supervisors are required to submit written evaluation of the candidate's performance as a basis for recommending the awarding of the BIS degree.

Standing - Pre-Degree Phase

A student who has satisfactorily completed the work specified in the term plan and who has submitted a satisfactory term report will be allowed to proceed to the next term as long as the limit on number of terms allowed in the Pre-Degree Phase of the program has not been reached.

A student who either has not submitted a term report or has not satisfactorily progressed in the work specified in the term plan will not be able to proceed in the program.

Independent Studies
Standing - Pre-Degree Phase
Appeal Procedures
Petition Procedures
Graduate Opportunities

Appeal Procedures

If a student wishes to appeal a grade, academic status or standing, the student should (as soon as possible and at the latest within six months of receipt of a decision) try to work the matter out informally with the instructor, officer or University authority concerned. If the problem cannot be resolved in this way, the student may submit an Application for Formal Inquiry to the Provost's Advisor on Interdisciplinary Programs.

Whether or not a student wishes to proceed informally or formally, advice and assistance may be secured either from the Director of Independent Studies, Registrar's Office, University Secretariat, and/or the Ombudsperson.

See page 1:10 for more information on the Student Appeals Policy and Procedures.

Petition Procedures

A petition should be used in those instances where a student seeks relief from normal program or university rules and regulations because of special circumstances such as illness or bereavement. Types of requests include requests to: drop or add courses after the appropriate faculty deadlines, or reconsider an academic decision. A statement from a physician, counsellor, etc., must accompany all petitions based on health-related grounds. Petition forms are available at the Independent Studies offices and the Registrar's Office.

Graduate Opportunities

The responsibility that students in this program must assume for their studies ensures that graduates will possess a high level of organizational skills, self-discipline and motivation combined with their attested academic development. These capabilities have prepared them well for further endeavours and have proven advantageous in their search for employment.

Graduates have been remarkably successful in building upon their degree programs to further their formal education. A sizeable number have gained graduate degrees, many on scholarship, from this and other Canadian universities and institutions as diverse as Columbia Teachers' College, Massachusetts Institute of Technology, and Cambridge University. In addition many have completed professional training in law, education, medicine, business and other areas. Others have tailored their programs to prepare themselves to meet specific job requirements, or have started their own companies.
Faculty of Mathematics

Campus pathways enroute to the Campus Centre (foreground) and the Mathematics and Computer Building (background).
Faculty of Mathematics

Introduction
Prior to 1967, Honours and General Mathematics programs were offered through the Faculties of Arts and Science. The continued growth and development of these programs led to the formation of the Faculty of Mathematics as a separate faculty in January, 1967. The Faculty consists of the Departments of Applied Mathematics, Combinatorics and Optimization, Computer Science, Pure Mathematics, Statistics and Actuarial Science, and a Division of Mathematics for Industry and Commerce. The degree Bachelor of Mathematics (BMath) is awarded upon successful completion of three-year General and four-year Honours programs.

The Faculty also offers graduate programs leading to the following degrees: Master of Mathematics (MMath), Master of Philosophy (MPhil) and Doctor of Philosophy (PhD). Detailed information is contained in the University of Waterloo Graduate Studies Calendar.

Faculty Brochure
The Faculty of Mathematics publishes a brochure specifically designed for Ontario secondary school students. Copies are available in school guidance offices, or on request from either the Mathematics Undergraduate Office or the Assistant Registrar, Faculty of Mathematics.

Admission

Current Admission Practices and Standards For Ontario Secondary School Applicants
The objective of any Admissions Committee is to admit the applicants who are best prepared for the program in question. In the Faculty of Mathematics, since there are traditionally more qualified applicants than places available, the admissions process is basically a competition for those places. The majority of students admitted to the Faculty have averages of 75% or higher. Students with lower averages may be admitted, however, if there is additional evidence to indicate an exceptional aptitude and interest in Mathematics.

Obviously, when the Admissions Committee is making its decisions, high grades are important. Academic performance, in particular, represents the single most influential factor in the decision process, and generally speaking, if a student’s Ontario Academic Course (OAC) marks are significantly higher relative to those of other applicants, the Admissions Committee will normally issue an Offer of Admission with only limited reference to other factors. For most applicants, however, the factors influencing the selection process include much more than simply grades from the senior year(s) of secondary school, and these other factors can represent a very important part of the final decision process. The Faculty recognizes, for example, that many excellent candidates for admission have chosen to develop their talents simultaneously in both academic and extra-curricular pursuits, and we feel that it is essential that such students receive every possible consideration for admission. In addition to superior academic performance, the Faculty is looking for students whose activities indicate significant development as well-rounded individuals with potential for leadership. These factors are particularly important for students in Co-op programs, since they are required to present themselves in the most favourable light to potential employers for their Co-op work terms.

All applicants to the Faculty of Mathematics are provided with a Supplementary Information Form as part of the package of materials sent by the University to acknowledge their application for admission. It is most important that applicants return this completed form to ensure that the Admissions Committee can make an informed decision. The information provided on the form, in many instances, allows the Committee to differentiate between applicants whose marks are relatively comparable.

As reflected by the nature of the questions on the Supplementary Information Form, the Admissions Committee takes a wide variety of factors into account during the selection process. The major factors, considered in conjunction with the applicant’s OAC marks, are listed in the Admission Requirements chart on page 2:7. A more detailed description of the entire admission process can be found in the Faculty of Mathematics brochure.

Admission as a Mature Student
Any student who has been away from formal education for more than two years and who does not possess the minimum requirements for admission may apply as a mature student. However, as a minimum, such applicants should have covered all the material in the required OAC mathematics courses (see page 2:7). It is preferable that these courses be taken through regular day school classes at a local secondary school, but alternatives include night school or summer school classes, or possibly correspondence courses through the Independent Learning Centre of the Ontario Ministry of Education. Applicants are also strongly encouraged to write the Descartes Mathematics Contest, administered by the Faculty of Mathematics for students in their senior year(s) of secondary school, to enhance their chances of admission. (Further details about the Descartes Contest, and how you can arrange to write it, can be obtained by writing to: The Canadian Math Competition, c/o Faculty of Mathematics.) Each application will be considered on its own merits by the Admissions Committee. (See also Part-time Studies on page 13:4.)
Advanced Standing

1. Applicants From Other University of Waterloo Faculties

Students in other University of Waterloo faculties who wish to apply for transfer to the Faculty of Mathematics may not preregister for a Mathematics program during the normal University preregistration periods. Instead, students in this position are encouraged to preregister for their first-choice program within their own faculty and apply for a transfer to Mathematics following the guidelines below.

Normally, internal transfer applications for on-campus studies in Mathematics are considered only for September admission to Honours programs. When special circumstances warrant, however, exceptions will be considered. Applicants should have high-quality academic records and have demonstrated that they can be successful in an Honours Mathematics program. Because of the traditional discrepancy between the number of applicants and the limited number of positions available for advanced-standing transfers, the selection process for admission is a competitive one. In recent years, the majority of students admitted have had consistent 70% grades or better in their previous University of Waterloo course work.

Application forms for September admission will be available from the Registrar’s Office or Mathematics Undergraduate Office (MC 5115), usually beginning in April each year. Completed application forms and all supporting documentation should be received by the Registrar’s Office no later than June 1 in order to guarantee consideration for September admission. Admission decisions will normally be conveyed in writing to applicants before the end of June. Those students offered admission will be required to consult with a Mathematics Faculty Advisor in July to discuss their revised preregistration course selection.

2. Applicants From Other Post-Secondary Institutions

Normally, external applications for advanced-standing admission to on-campus studies in Mathematics from students at other post-secondary institutions are considered only for September admission to Honours programs. When special circumstances warrant, however, exceptions will be considered. Applicants should have high-quality academic records and have demonstrated that they can be successful in an Honours Mathematics program. Because of the traditional discrepancy between the number of applicants and the limited number of positions available for advanced-standing transfers, the selection process for admission is a competitive one. In recent years, the majority of students admitted have had consistent B grades or better in their previous post-secondary course work. Information supplied on an applicant’s Supplementary Information Form is also an important factor in the admission decision process.

Application packages for applicants from other post-secondary institutions can be obtained from the Registrar’s Office at the University of Waterloo, usually starting in November each year. Applicants must apply through the Ontario Universities’ Application Centre and provide supporting documentation directly to the Registrar’s Office at the University of Waterloo. This documentation must include official transcripts from all previous academic institutions. To be guaranteed consideration for September admission, all supporting documentation must be received by the University no later than July 1.

3. Residency/Registration Requirement

Students transferring to the Faculty of Mathematics from other UW faculties or other post-secondary institutions must normally complete, while they are registered in the Faculty of Mathematics, at least 50% of the minimum number of math half-credits and at least 50% of the total number of half-credits required for their BMath degree program. Students transferring into a Co-operative program must normally complete, while they are registered in the Faculty of Mathematics, at least 50% of the total number of Co-op work terms required for their BMath Co-op degree and at least two of their four required Co-op work reports.

4. Satisfying Basic and Complete-term Registration Requirements for a BMMath Honour’s Degree

As indicated in Table I on page 13:8, the requirements for a BMMath Honour’s degree include the stipulation that a student must normally complete a minimum of eight “basic” terms, including at least four “complete” terms. Students transferring to the Faculty of Mathematics from other UW faculties or other post-secondary institutions may be allowed to count all or part of their university-level studies prior to admission to the Faculty toward the basic and complete-term registration requirements for a BMMath Honour’s degree, to a maximum of four basic terms and two complete terms. Any such allowances will be noted as part of the student’s transfer credit assessment.

5. Transfer Credits

Once students transferring from outside or within the University of Waterloo have been admitted to the Faculty of Mathematics, they will normally be given transfer credit for relevant courses taken previously if (i) a mark of at least 60% or equivalent has been obtained, (ii) a mark of at least 50% has been obtained in a non-mathematics University of Waterloo mathematics course specifically designed for mathematics students. A transfer failure will normally be assigned if a mark is less than 50%. Credit may not be granted for a course covering only part of the material contained in a corresponding UW course which is required of students registered in the Faculty of Mathematics.
6. Cumulative Averages
Courses taken while a student was registered in another UW faculty or at another post-secondary institution may be counted for BMath degree credit, but the grades in such courses will not be included in cumulative averages relevant to BMath degree studies.

7. Double Counting of Courses for BMath Degree Credit
The Faculty of Mathematics will normally count for BMath degree credit a maximum of 50% of the courses that a student has previously used, or is using simultaneously, to obtain a degree from another UW faculty or at another university.

8. Co-operative Programs
Applicants are not normally considered for admission to a Co-operative program beyond the second-year level. Students applying for admission at the second-year level should normally have credit in courses equivalent to the first-year Calculus, Algebra, and Computer Science courses required of University of Waterloo mathematics students. Applicants who cannot be admitted to a Co-operative program will be automatically considered for the Regular program.

Part-time Studies
Students wishing to work toward a BMath degree on a part-time basis must meet the Faculty’s regular admission requirements. The three-year BMath General degree may be obtained entirely by part-time studies. However, as indicated in Table I on page 13:8, the BMath Honours degree involves extensive on-campus full-time residency requirements.

Although mathematics (i.e. ACTSC, AM, C&O, CS, MATH, PMATH, STAT) courses are not normally offered in the evenings or on Saturdays, many part-time students take courses offered by the Faculty of Mathematics via the University of Waterloo Correspondence Program. (See Chapter 1 for more details of this program. A separate brochure is also available.) As well, a reasonable cross-section of non-math courses is available in the evenings, particularly during the Fall/Winter sessions.

Applicants who do not meet the Faculty’s regular admission requirements may be admitted as non-degree/post-degree part-time students at the discretion of the Admissions Committee. Admission as a non-degree/post-degree student does not carry any commitment from the University beyond permitting entry to the course(s) and term(s) specified at the time admission is granted. There is no guarantee of admission for subsequent terms, although repeat applications on a non-degree/post-degree basis are always considered and have rarely been refused in the past (especially applications to take UW correspondence courses where limited on-campus space is not a factor).

After completing some courses on a non-degree/post-degree basis, usually first-year Calculus and Algebra in the UW Correspondence Program, a student may re-apply for admission as a BMath degree candidate. No special application form is required; simply write to the Assistant Registrar, Faculty of Mathematics, in Needles Hall. The Admissions Committee will then review the applicant’s past academic history, including performance in UW courses taken on a non-degree/post-degree basis, to make its decision. If the admission decision is favourable, any relevant courses taken on a non-degree/post-degree basis will be counted toward the BMath degree. Furthermore, any previous academic work completed prior to commencing UW studies will be assessed for possible transfer credit.

Admission to Specialized Programs in Mathematics
Listed below are the three admission categories for the Faculty of Mathematics, accompanied by the corresponding Ontario Universities’ Application Centre (OUAC) codes:

- Co-op (Accounting Options) – WN
- Co-op (including Computer Science) – WT
- Regular (including Computer Science) – WM

Unlike past years, when Math/Chartered Accountancy applicants applied for the WN Co-op category and Math/Management Accounting applicants applied for the WT Co-op category, there is now only one admission category for Math/Accounting students, namely WN: Mathematics – Accounting Options (Co-op), and it includes applicants for both Chartered Accountancy and Management Accounting. Students wishing to pursue one of the Joint Honours Co-op Math/Accounting/Computer Science programs should apply to the Accounting admission category WN rather than WT for Computer Science.

Students interested in registering in the Faculty of Mathematics through St. Jerome’s College have the opportunity to indicate their intention when they receive the package of materials sent by the University to acknowledge their application for admission. However, the same application categories and admission criteria apply.

Once admitted, students identify with a specific program within the Faculty at different year levels, depending upon admission category and particular program of interest. The only students to be admitted to specialized Honours programs in first year are Co-op students who wish to register in one of the following programs:

- Co-op Applied Math With Engineering Electives
- Co-op Math/Chartered Accountancy
- Co-op Math/Management Accounting

Students in the above Co-op programs need to be explicitly identified in Year One because of the specialized nature of their work-term employment. All other students register in the Faculty Inter-Departmental Honours program in Year One. In subsequent years, beginning with Year Two, students may wish to enter a specialized program or choose to
remain registered in the Inter-Departmental Honours program.

For many specialized Honours programs, admission at the Year Two level is normally automatic for students who have successfully completed Year One. However, in the case of restricted enrolment programs, there is a formal admission process. Academic performance in first year and/or the results of personal interviews are normally the main criteria for admission to restricted enrolment programs.

**Restricted Enrolment Mathematics Programs**

At present, the restricted enrolment programs in the Faculty of Mathematics consist of the following:

- Co-op Math/Chartered Accountancy
- Co-op Math/Management Accounting
- Co-op Teaching Option
- *All Computer Science Major Programs (Co-op and Regular)*

*The Co-op Math/Teaching Option is considered a "Restricted Enrolment Program" only because students must formally apply for admission after completing Year One and are selected for the program through an interview process, not because of any excessive demand for positions in the program. In fact, at present, the number of Co-op work-term placement opportunities exceeds enrolment in the Teaching Option program. Students with an interest in teaching Mathematics and Computer Science are encouraged to pursue this goal by applying for this program.*

**In recent years, because sufficient places have been available to meet student demand, it has been possible to suspend the formal Computer Science admission process and allow all students who successfully complete their Year One studies with at least 60% averages into the Computer Science Major program of their choice. Although this suspension of the admission process cannot be guaranteed for future years, it is expected to continue in effect for students commencing their studies in September, 1991. For further details concerning the formal admission process and on-going eligibility standards for Computer Science Major programs, please consult page 13:17.**

In the foreseeable future, the Faculty does not expect that any of its programs not included in the above list will require a formal admission process beyond that involved with admission to the Faculty of Mathematics. However, because of limited resources and varying demands, it is always possible that occasions may arise when other specific programs within the Faculty are not able to accommodate all academically qualified applicants. Every effort will be made to avoid such situations and to provide acceptable alternatives, but the Faculty cannot guarantee in advance that any specific program will be free of enrolment restrictions.

**Academic Programs and Degree Requirements**

**Undergraduate Degrees: New vs. Old**

In recent years, the Faculty of Mathematics has offered undergraduate programs leading to the following Bachelor of Mathematics degrees: four-year BMath Honours degree for successful completion of a 44-half-credit Honours program; four-year BMath General degree for completion of a 42-half-credit General program; three-year BMath Pass degree for completion of a 32-half-credit Pass program. However, in the Fall of 1988, the Faculty received approval from the University of Waterloo Senate to reduce the standard number of half-credits required for a four-year BMath Honours degree from 44 to 40. It also received Senate approval to discontinue its four-year BMath General and three-year BMath Pass programs, and to offer in their place a new three-year General program, requiring 30 half-credits, successful completion of which will lead to a three-year BMath General degree.

**New vs. Old Degrees: Who is Eligible for What?**

Students registering in the Faculty of Mathematics as degree candidates for the first time in the Fall, 1989 term or thereafter will not be eligible to pursue any of the old BMath degrees, namely the 44-half-credit BMath Honours degree, the four-year BMath General degree, or the three-year BMath Pass degree, but must pursue instead one of the new degrees, either a 40-half-credit BMath Honours degree or the three-year BMath General degree. Clearly, students already registered in the Faculty as degree candidates prior to the Fall, 1989 term will continue to be eligible for any of the old BMath degrees, provided they meet all of the relevant degree requirements specified in an appropriate pre-1989/90 University of Waterloo Undergraduate Calendar. However, under certain circumstances, outlined in Footnotes 2 and 3 to Table 1 on page 13:8, a subset of such pre-Fall/89 students will also be eligible to pursue one of the new BMath degrees.
Any students who are uncertain about which degrees they are eligible to pursue should consult with their Faculty Advisor.

**Three-year General vs. Four-Year Honours Programs: A Comparison**

BMath Honours programs are designed for full-time on-campus students who wish to pursue four years of in-depth studies in the Mathematical Sciences. Honours programs are more demanding than the General program, in that they require more in-depth mathematics courses, a higher proportion of mathematics vs. non-mathematics courses, and a larger total number of courses. The three-year BMath General program, on the other hand, is intended for students who, while they have a definite interest in Mathematics, may prefer more latitude in the depth and breadth of their course selection, or perhaps simply want to limit their studies at university to three academic years rather than four. The course requirements for a three-year BMath General degree allow students to pursue a more general education and include a larger proportion of non-mathematics courses in their program than is the case with Honours programs, a feature which can often appeal, for example, to students seeking a pre-professional university program. Furthermore, since there are no on-campus full-time residency requirements for a three-year BMath General degree, students can pursue such a program on either a full or part-time basis, either on campus or by correspondence through the University of Waterloo Correspondence Program.

**Co-op vs. Regular: Degree Requirements and Programs Available**

Most of the Faculty's four-year Honours programs are available in both the Regular (i.e. conventional September to April academic year) and Co-operative (i.e. alternating four-month academic and work terms) systems of study. There are a number of Honours programs, however, that are available only in the Co-operative system of study. In the individual program descriptions that follow on pages 13:12 - 13:29, those programs that are offered only for Co-op students are explicitly indicated as such.

Wherever Honours programs are available in both systems of study, the academic degree requirements are identical for both Co-operative and Regular students. Additional degree requirements, pertaining to work terms and written work-report aspects of Co-operative programs, are included in a booklet, 'Co-operative Student Reference Manual', which is available from the Co-operative Education and Career Services Department.

The three-year BMath General program is available only in the Regular system of study.

**Satisfying Basic And Complete-Term Registration Requirements For A BMath Honours Degree**

As indicated in Table I on page 13:8, the requirements for a 40-half-credit BMath Honours degree include the stipulation that a student must normally complete a minimum of eight "basic" terms, including at least four "complete" terms. (Please consult Footnotes 11 and 12 to Table I on page 13:9 for the relevant definitions of "complete" and "basic" terms.) Normally, all of these terms are ones in which the student is registered as a University of Waterloo BMath degree candidate. However, for some advanced-standing admissions transferring from other University of Waterloo faculties or other post-secondary institutions, exceptions may be warranted, allowing such students to count all or part of their university-level studies prior to admission to the Faculty toward the basic and complete-term registration requirements for a BMath Honours degree.

Commencing with students admitted to the Faculty of Mathematics for the Fall, 1989 term, advanced-standing transfer students will be informed, at the time of their admission and as part of their BMath transfer-credit assessment, to what extent, if any, the normal minimum basic and complete-term registration requirements for a BMath Honours degree will be reduced, based upon their studies prior to admission to the Faculty. Advanced-standing transfer students, who were admitted to the Faculty prior to the Fall/89 term, if they wish to request that their studies prior to admission to the Faculty be similarly assessed, should address their requests, in writing and as soon as possible, to the Math Faculty Standings and Promotions Committee.

**Responsibility For Meeting Degree Requirements**

Under the Math Faculty's course-credit system, it is each student's responsibility to be aware of all regulations pertaining to his/her program of study. When all requirements for a particular BMath degree have been met, it is the student's responsibility to submit a completed 'Intention to Graduate' form to the Registrar's Office in Needles Hall.

**Common Degree Requirements**

The usual course load each term for first-year Mathematics freshmen consists of Algebra, Calculus, and Computer Science, regardless of which particular program may be of potential interest in later years, plus two non-mathematics courses which may depend, but not necessarily, upon the program(s) of potential later interest. This commonality of core curriculum, which continues to a large extent into Year Two, permits considerable flexibility for students to change from one program to another within the Faculty. In fact, if non-math courses are chosen judiciously, this flexibility for change can be extended to many programs in other faculties as well.
**Honours Programs**

**Single Honours Programs**
The Faculty offers Honours Programs in each of the following departmental areas:
- Actuarial Science
- Applied Mathematics
- Combinatorics and Optimization
- Computer Science
- Pure Mathematics
- Statistics

In addition, the Faculty offers a number of Honours Programs that cross department boundaries:
- Inter-departmental Program
- Mathematics/Teaching Option
- Operations Research

There are also a number of programs that cross Faculty boundaries:
- Applied Mathematics with Electives in Engineering
- Applied Mathematics with Physics Electives
- Applied Statistics with Engineering Electives
- Computer Science with Electrical Engineering Electives
- Computer Science – Information Systems Option
- Mathematics/Chartered Accountancy Option
- Mathematics/Business Administration Option
- Mathematics/Management Accounting Option

**Double Honours ‘X’ and ‘Y’ Programs**
All Honours requirements for both areas ‘X’ and ‘Y’ must be satisfied. ‘X’ and ‘Y’ refer to any two of Actuarial Science, Applied Mathematics, Combinatorics and Optimization, Computer Science, Operations Research, Pure Mathematics, and Statistics (with the exception that the combination Combinatorics and Optimization and Operations Research is not an officially recognized Double Honours Program). Note that, with some ‘X’ and ‘Y’ combinations, it may be necessary to complete more than 40 half-credits and/or more than eight full-time terms of study to satisfy all of the relevant course requirements.

**Joint Honours ‘X’ and ‘Y’ Programs**
Joint Honours ‘X’ and ‘Y’ programs, in conjunction with the common degree requirements in Table I on page 13:8, require a total of 40 half-credits: the ten mathematics half credits in the Faculty core (outlined in Table II on page 13:10) plus the joint requirements of the two departments for a minimum of 28 mathematics half-credits, and ten non-math half-credits. Joint requirements for each department can be found in the corresponding department description. ‘X’ and ‘Y’ refer to any two of Actuarial Science, Applied Mathematics, Combinatorics and Optimization, Computer Science, Pure Mathematics, and Statistics.
## Table I - Degree Requirements Common To All BMath Programs

<table>
<thead>
<tr>
<th>Requirements</th>
<th>Four-Year Honours Programs</th>
<th>Three-Year General Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum total half credits</td>
<td>40², ⁴</td>
<td>30</td>
</tr>
<tr>
<td>Minimum math half-credits</td>
<td>20 - 28⁸</td>
<td>15</td>
</tr>
<tr>
<td>Minimum non-math half-credits</td>
<td>ten⁷</td>
<td>ten</td>
</tr>
<tr>
<td>Minimum Graduating Math Average</td>
<td>60%</td>
<td>60%</td>
</tr>
<tr>
<td>Minimum Graduating Overall Average</td>
<td>60%</td>
<td>60%</td>
</tr>
<tr>
<td>Maximum course attempts allowed</td>
<td>50 half-credits</td>
<td>40 half-credits</td>
</tr>
<tr>
<td>Maximum total failures allowed</td>
<td>six half-credits</td>
<td>eight half credits</td>
</tr>
<tr>
<td>Minimum number of complete terms</td>
<td>four</td>
<td>none</td>
</tr>
<tr>
<td>Minimum number of basic terms</td>
<td>eight, including the four complete terms required above</td>
<td>none</td>
</tr>
<tr>
<td>English Writing Skills</td>
<td>All BMath degree candidates must satisfy an English Writing Skills Requirement. Please see section (7) on page 13:36 for details.</td>
<td></td>
</tr>
</tbody>
</table>

### Footnotes to Table I

1. Table I, in conjunction with Table II on page 13:10, summarizes the degree requirements which are common to all BMath degree programs. Further specific degree requirements and recommendations for individual programs are described on pages 13:12 - 13:29.

2. Commencing with graduates at the May, 1990 Convocation, all students will be eligible to graduate with a four-year 40-half-credit BMath Honours degree, provided that they have been registered for at least one basic term (see Footnote 12 below for the definition of a ‘basic term’) in 1990 or thereafter and they meet all other relevant degree requirements described in this Calendar (allowing the course substitutions specified in Table IV on page 13:11 for students who registered in the Faculty of Mathematics as degree candidates prior to the Fall, 1989 term. Pre-Fall/89 students should also consult the section, “New vs. Old Degrees: Who Is Eligible For What?”, on page 13:5).

3. Commencing with graduates at the May, 1990 Convocation, all students will be eligible to graduate with a three-year 30-half-credit BMath General degree, provided that they have been registered for at least one term in 1990 or thereafter and they meet all relevant degree requirements described in this Calendar (allowing the course substitutions specified in Table IV on page 13:11 for students who registered in the Faculty of Mathematics as degree candidates prior to the Fall, 1989 term. Pre-Fall/89 students should also consult the section, “New vs. Old Degrees: Who Is Eligible For What?”, on page 13:5).

4. The standard total number of half-credits required for a four-year Honours program is 40. However, for some Double Honours BMath programs combining majors within the Faculty (see page 13:7) and some Joint Honours BMath programs with academic disciplines outside Mathematics (see page 13:7), it may be necessary to complete more than 40-half-credits and/or more than eight terms of study to satisfy all relevant course requirements.
5. The term 'math half-credit' includes courses with prefixes ACTSC (Actuarial Science), AM (Applied Mathematics), C&O (Combinatorics and Optimization), CS (Computer Science), MATH (non-departmental Faculty courses), PMATH (Pure Mathematics, and STAT (Statistics).

6. The actual minimum number of math half-credits required for a four-year BMath Honours degree varies from one program to another within the range specified in Table I above, except for Double Honours BMath programs combining majors within the Faculty (see page 13:21) where some combinations may require more than 28 math half-credits. Individual program requirements are included with the detailed program descriptions on pages 13:12 - 13:29.

7. The term 'non-math half-credit' refers to courses offered by other faculties, as well as those with the course prefix MTHEL offered by the Faculty of Mathematics.

Every BMath degree program requires at least ten non-math half-credits and most programs require no more than ten. Some four-year Honours programs, however, such as the Math/Accounting and Math/Business Options, for example, require more than ten specified non-math half-credits. Unless the specific course requirements in a program’s individual description (see pages 13:12 - 13:29) include more than ten specified non-math half-credits, it may be assumed that a total of ten non-math half-credits will suffice for that program.

8. i) The 'Graduating Math Average' is based on the specified minimum number of successfully completed math half-credits required by the student’s program. (See Footnote 6 earlier.) All Faculty and Departmental courses required for a particular program are included in this average.

ii) The 'Graduating Overall Average' is based on the specified minimum total number of successfully completed half-credits (40 for four-year Honours programs, 30 for the three-year General program) submitted for the particular degree. It includes all the math courses on which the Graduating Math Average is based and all required non-math courses.

iii) For the Math/Accounting and Math/Accounting/Computer Science programs, students must also achieve an average of at least 70% in all the courses with prefix ACC which are explicitly required for their program.

iv) The averages in i), ii) and iii) above all exclude failures. If a passed course is repeated, only the better mark is considered. For averages i) and ii), if a student successfully completes more than the minimum number of credits, the 'excess' ones with the lowest grades are excluded.

9. A 'course attempt' refers to a course registration not formally cancelled with the Registrar’s Office. (See section 5.8 on page 13:33 re: dropping and adding courses and relevant deadline dates.)

10. A course attempt not successfully completed constitutes a course 'failure'. (See section 3.1 on page 13:31 for a complete list of 'failing' grades.)

11. A 'complete term' is one in which a student successfully completes a minimum of five half-credits, at least two of which must be math half-credits, with no failures that term.

12. A 'basic term' is one in which a student's course load consists of at least four half-credits.
Table II – Four-Year BMath Honours Programs: Required Year One and Two Faculty Core Courses/Typical Course Loads

<table>
<thead>
<tr>
<th>Term 1A</th>
<th>Term 1B</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 135 Algebra</td>
<td>MATH 136 Linear Algebra 1</td>
</tr>
<tr>
<td>MATH 137 Calculus 1</td>
<td>MATH 138 Calculus 2</td>
</tr>
<tr>
<td>CS 131 Principles of Computer Science 1</td>
<td>CS 132 Principles of Computer Science 2</td>
</tr>
<tr>
<td>two non-math half credits</td>
<td>two non-math half-credits</td>
</tr>
</tbody>
</table>

Term 2A

<table>
<thead>
<tr>
<th>Term 2B</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 235 Linear Algebra 2</td>
</tr>
<tr>
<td>MATH 237 Calculus 3</td>
</tr>
<tr>
<td>STAT 230 Probability</td>
</tr>
<tr>
<td>one non-math half-credit</td>
</tr>
<tr>
<td>one additional half-credit</td>
</tr>
</tbody>
</table>

Each of terms 3A, 3B, 4A, 4B:

| three math half-credits                                   |
| one non-math half-credit                                  |
| one additional half-credit                                |

Footnotes to Table II

1. Table II includes the Year One and Two Faculty core Honours math courses, in the terms they are normally taken, which are required in all four-year BMath Honours degree programs. (In certain cases, course substitutions for the specific courses listed in Table II may be made to satisfy degree requirements. Please consult Tables III and IV on page 13:11.) Further specific course requirements and recommendations which depend upon a particular program are described on pages 13:12 - 13:29.

2. The term 'math half-credit' includes courses with prefixes ACTSC (Actuarial Science), AM (Applied Mathematics), C&O (Combinatorics and Optimization), CS (Computer Science), MATH (non-departmental Faculty courses), PMATH (Pure Mathematics), and STAT (Statistics).

   The term 'non-math half-credit' refers to courses offered by other faculties, as well as those with the course prefix MTHEL offered by the Faculty of Mathematics.

3. In addition to specifying the common required Faculty core courses, Table II also presents a 'typical' course-load mix of math vs. non-math courses. The particular mix presented yields, over the period of eight full-time terms of study, a total of 24 math half-credits, ten non-math half-credits, and six additional half-credits (which can be any blend between math and non-math courses). It is not intended, however, that the mix presented should be a rigid one applicable to all students. It is included only as a guideline for how a 'typical' student might distribute his/her course load over four academic years of study. The actual mix of courses each term, especially in Years Three and Four, will vary from one program to another, depending upon the minimum numbers of math and non-math half-credits required, and from one student to another, depending upon how they wish to select their 'additional' free-choice courses.
Table III – Advanced vs. Honours Course Substitutions

A number of mathematics courses are offered at two different levels for BMath Honours degree credit to accommodate a variety of students requiring these courses for their academic program. In the first two years of study, the more challenging level, "Advanced", is intended for a relatively small number of exceptionally gifted students. The second level, "Honours"; is intended for all students in Honours programs who are not taking the Advanced courses. In the case of the third-year courses listed in the "Advanced" column below, while the distinction is between the more in-depth courses designed primarily for Pure Math Majors and corresponding non-major courses designed for students in other programs, students with strong academic records, regardless of program, are encouraged to take the courses listed as "Advanced." Advanced courses may always be substituted in lieu of the corresponding Honours courses to satisfy BMath Honours degree requirements, regardless of academic program.

<table>
<thead>
<tr>
<th>Honours</th>
<th>Advanced</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 135/136</td>
<td>MATH 145/146</td>
<td>1A/B Algebra</td>
</tr>
<tr>
<td>MATH 137/138</td>
<td>MATH 147/148</td>
<td>1A/B Calculus</td>
</tr>
<tr>
<td>MATH 235</td>
<td>MATH 245</td>
<td>2A Linear Algebra</td>
</tr>
<tr>
<td>MATH 237</td>
<td>MATH 247</td>
<td>2A Calculus</td>
</tr>
<tr>
<td>STAT 230/231</td>
<td>STAT 240/241</td>
<td>Probability/Statistics</td>
</tr>
<tr>
<td>AM 331/PMATH 331</td>
<td>PMATH 351</td>
<td>Real Analysis</td>
</tr>
<tr>
<td>AM 332/PMATH 332</td>
<td>PMATH 352</td>
<td>Complex Analysis</td>
</tr>
<tr>
<td>PMATH 334</td>
<td>PMATH 344</td>
<td>Rings and Fields</td>
</tr>
<tr>
<td>PMATH 336</td>
<td>PMATH 343</td>
<td>Group Theory</td>
</tr>
</tbody>
</table>

Table IV – ‘New’ vs. ‘Old’ Course Substitutions

For purposes of satisfying 40-half-credit BMath Honours and 30-half-credit BMath General degree requirements, the 'old' courses listed below will be considered equivalent to the corresponding 'new' courses for the subset of pre-Fall/89 students who are eligible to pursue the new BMath degrees. (Please consult Footnotes 2 and 3 to Table I on page 13:8, and the section on page 13:5 labelled “New vs. Old Degrees: Who Is Eligible For What?”.) Students should consult with their Faculty Advisor if they have further questions about course substitutions.

<table>
<thead>
<tr>
<th>Old Course</th>
<th>New Course</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 180</td>
<td>CS 131</td>
<td>1A CS</td>
</tr>
<tr>
<td>CS 140</td>
<td>CS 132</td>
<td>1B CS</td>
</tr>
<tr>
<td>CS 235</td>
<td>CS 230</td>
<td>Year 2 CS (non-specialist)</td>
</tr>
<tr>
<td>CS 250</td>
<td>CS 241</td>
<td>2A CS (Majors)</td>
</tr>
<tr>
<td>CS 240</td>
<td>CS 242</td>
<td>2B CS (Majors)</td>
</tr>
<tr>
<td>CS 358</td>
<td>CS 351</td>
<td>Year 3 CS (Majors)</td>
</tr>
<tr>
<td>MATH 134A/B</td>
<td>MATH 135/136</td>
<td>1A/B Algebra</td>
</tr>
<tr>
<td>MATH 130A/B</td>
<td>MATH 137/138</td>
<td>1A/B Calculus</td>
</tr>
<tr>
<td>MATH 144A/B</td>
<td>MATH 145/146</td>
<td>1A/B Algebra (Advanced)</td>
</tr>
<tr>
<td>MATH 140A/B</td>
<td>MATH 147/148</td>
<td>1A/B Calculus (Advanced)</td>
</tr>
<tr>
<td>MATH 224A</td>
<td>MATH 225</td>
<td>2A Linear Algebra (General)</td>
</tr>
<tr>
<td>MATH 220A</td>
<td>MATH 227</td>
<td>2A Calculus (General)</td>
</tr>
<tr>
<td>MATH 234A</td>
<td>MATH 235</td>
<td>2A Linear Algebra</td>
</tr>
<tr>
<td>MATH 230A</td>
<td>MATH 237</td>
<td>2A Calculus</td>
</tr>
<tr>
<td>MATH 244A</td>
<td>MATH 245</td>
<td>2A Linear Algebra (Advanced)</td>
</tr>
<tr>
<td>MATH 240A</td>
<td>MATH 247</td>
<td>2A Calculus (Advanced)</td>
</tr>
<tr>
<td>MATH 230B or 240B</td>
<td>AM 231</td>
<td>Calculus 4</td>
</tr>
<tr>
<td>MATH 234B</td>
<td>PMATH 336</td>
<td>Group Theory</td>
</tr>
<tr>
<td>MATH 244B</td>
<td>PMATH 343</td>
<td>Group Theory (Advanced)</td>
</tr>
<tr>
<td>PMATH 331</td>
<td>AM 331/PMATH 331</td>
<td>Real Analysis</td>
</tr>
<tr>
<td>MATH 332B</td>
<td>AM 332/PMATH 332</td>
<td>Complex Analysis</td>
</tr>
<tr>
<td>PMATH 351A</td>
<td>PMATH 351</td>
<td>Real Analysis</td>
</tr>
<tr>
<td>PMATH 351B</td>
<td>PMATH 353</td>
<td>Fourier Analysis</td>
</tr>
</tbody>
</table>
Actuarial Science

The Department of Statistics and Actuarial Science offers courses and programs in Actuarial Science which is the application of mathematics and statistics to financial problems with particular emphasis on life insurance, casualty insurance, and employee benefit programs. The courses offered provide theoretical preparation for the courses of the Society of Actuaries and the Casualty Actuarial Society and include studies of such subject areas as Mathematics of Finance, Life Contingencies, Risk Theory, and Casualty Ratemaking.

By carefully selecting their non-math courses, students can also gain valuable background knowledge in economics, finance, administration, and law.

Honours Actuarial Science

In conjunction with the common degree requirements in Table I on page 13:8, this program requires at least 26 math half-credits. These overall requirements must include the Faculty core courses outlined in Table II on page 13:10 and the following specific courses:

All of
- ACTSC 231 Mathematics of Finance
- ACTSC 232 Introduction to Actuarial Mathematics
- ACTSC 331 Life Contingencies – Single Lives
- ACTSC 431 Risk Theory

One of
- ACTSC 332 Life Contingencies – Multiple Lives
- ACTSC 432 Loss Distributions and Credibility Theory

Six additional half-credits chosen from:
- ACTSC 332 Life Contingencies – Multiple Lives
- ACTSC 335 OR Applications in Actuarial Science
- ACTSC 338 Graduation of Life Tables
- ACTSC 363 Topics in Casualty Insurance 1
- ACTSC 432 Loss Distributions and Credibility Theory
- ACTSC 433 Analysis of Mortality Data
- ACTSC 435 Introduction to Demographic Statistics
- ACTSC 453 Basic Pension Mathematics
- AM 341/CS 337 Introduction to Numerical Analysis
- STAT 331 Applied Linear Models

All of
- STAT 330 Statistical Theory and Methods
- STAT 333 Applied Probability

Three additional 400-level or higher math half-credits

Joint Honours Actuarial Science and ‘X’

See page 13:7 for a complete description of Joint program requirements.

All of
- ACTSC 231 Mathematics of Finance
- ACTSC 232 Introduction to Actuarial Mathematics
- ACTSC 331 Life Contingencies – Single Lives
- ACTSC 431 Risk Theory
- MTHEL 305A General Life Insurance 1

Two additional 400-level ACTSC half-credits

Two additional half-credits chosen from
- Any 300- or 400-level ACTSC half-credit
- AM 341/CS 337 Introduction to Numerical Analysis
- MTHEL 305B General Life Insurance 2
- STAT 330 Statistical Theory and Methods
- STAT 331 Applied Linear Models

Honours ‘X’ with Actuarial Science Minor

See page 13:7 for a complete description of Minor program requirements.

All of
- ACTSC 231 Mathematics of Finance
- ACTSC 232 Introduction to Actuarial Mathematics
- ACTSC 331 Life Contingencies – Single Lives
- ACTSC 332 Life Contingencies – Multiple Lives
- MTHEL 305A General Life Insurance 1

One of
- ACTSC 431 Risk Theory
- ACTSC 432 Loss Distributions and Credibility Theory

One additional ACTSC half-credit.

Post-Degree Diploma in Actuarial Science

This program is described on page 13:28.
Applied Mathematics

Applied Mathematics is motivated mathematics, or mathematics to a purpose. It reflects the belief that there exists a basic order and harmony in the physical world which can be described by the logical structures of mathematics. Thus, it is no coincidence that some of the greatest mathematicians of the past were also interested in engineering and physics.

This rich, classical tradition of Applied Mathematics is typified by the ongoing work in Theoretical and Fluid Mechanics, General Relativity, and Quantum Theory, at the interface among Mathematics, Theoretical Physics, and Engineering, and covering such diverse areas as the study of supersonic flow, the behaviour of ocean waves, the structure of space-time and cosmology, and the fundamental symmetry properties of the world of atoms and molecules. In addition, newer areas such as Control Theory and Information Theory analyze processes ranging from optimal control of a space vehicle to the measuring, coding, and transmission of information. As scientists find out more and more about the mechanisms that make the world 'tick', we also find that more, often new, mathematics is necessary to systematize, digest, and take advantage of this wealth of knowledge in all scientific areas. This need is often reflected in a keen interest among applied mathematicians in ordinary and partial differential equations and their discretizations.

In their first two years, all Applied Mathematics students take the same core courses as other Mathematics students, in order to acquire a sound mathematical background. At the same time, since the application of analytical reasoning to a wide variety of problems is the essence of Applied Mathematics, there is room in the program for introductory courses in scientific disciplines which are heavy users of mathematics, such as Physics or Engineering. In the upper years, the focus is on courses more specifically related to their chosen area of specialization. It is our belief that graduates from any of our programs will find their career opportunities to be excellent and varied.

The Applied Mathematics Department offers four Honours programs, each consisting of the common requirements listed below, plus specific other requirements as given in the individual program descriptions following.

Requirements Common to All Honours Applied Mathematics Programs

In conjunction with the common degree requirements in Table I on page 13:8, all Honours Applied Mathematics programs must include the Faculty core courses outlined in Table II on page 13:10 and the following specific courses:

All of
- AM 231 Calculus 4
- AM 251 Modelling with Systems of Ordinary Differential Equations
- AM/PMATH 332 Complex Analysis
- AM 351 Ordinary Differential Equations
- AM 353 Partial Differential Equations 1

All of
- PHYS 121 Mechanics, Wave Motion and Heat 1
- PHYS 122 Mechanics, Wave Motion and Heat 2

A minimum of eight additional non-math half-credits

Recommended
- AM 250 Modelling with Ordinary Differential Equations
- AM/PMATH 331 Real Analysis

Honours Applied Mathematics

In conjunction with the common degree requirements in Table I on page 13:8, this program requires at least 26 math half-credits. These overall requirements must include the courses common to all Honours Applied Mathematics programs as given above and the following specific courses:

Three 400-level AM half-credits

Three additional 300- or 400-level AM half-credits

One additional half-credit chosen from:
- AM 341/CS 337 Introduction to Numerical Analysis
- AM/PMATH 331 Real Analysis

Joint Honours Applied Mathematics and 'X'

See page 13:7 for a complete description of Joint program requirements.

All of
- AM 231 Calculus 4
- AM 251 Modelling with Systems of Ordinary Differential Equations
- AM/PMATH 332 Complex Analysis
- AM 351 Ordinary Differential Equations
- AM 353 Partial Differential Equations 1

Three 400-level AM half-credits

One of
- AM341/CS 337 Introduction to Numerical Analysis
- CS 372 Introduction to Scientific Computation: Numerical Linear Algebra
- CS 374 Introduction to Scientific Computation: Numerical Approximation
- AM/PMATH 331 Real Analysis

One additional 300- or 400-level AM half-credit

All of
- PHYS 121 Mechanics, Wave Motion and Heat 1
- PHYS 122 Mechanics, Wave Motion and Heat 2
Honours Applied Mathematics with Electives in Engineering (Co-operative only)

In conjunction with the common degree requirements in Table I on page 13:8, this program requires at least 26 math half-credits. These overall requirements must include the courses common to all Honours Applied Mathematics programs as given above and the following specific courses:

Three 400-level AM half-credits
Three additional 300- or 400-level AM half-credits

All of

CS 230 Introduction to Computers and Computer Systems

One additional half-credit chosen from:
AM 341/CS 337 Introduction to Numerical Analysis
AM/PMATH 331 Real Analysis

Two additional half-credits chosen from:
AM/PMATH 331 Real Analysis
CS 334 Data Types and Structures
AM 341/CS 337 Introduction to Numerical Analysis
C&O 350 Linear Programming
C&O 370 Deterministic OR Models
PMATH 336 Introduction to Group Theory
STAT 333 Applied Probability
STAT 371 Stochastic OR Models
STAT 433 Stochastic Processes

Non-math courses required in Year One:
Groups D and E require E&CE 123 and 126, either both in term 1B, or one each in terms 1B and 2A. Group F requires CH E 100/101.

Non-math courses required in Years Two, Three and Four:
One course per term from the chosen Engineering Group, normally selected from the following. (Consult the Applied Mathematics Undergraduate Handbook for more detailed listings, including course titles and terms in which the courses are normally taken.)

Group A
M E 219, 220;
Four of M E 351,
CIV E 303, 403, 404, 405, 413,
414, 415.

Group B
SY DE 252, 281, 372, 381.
Two of SY DE 432, 442, 444, 533, 543

Group C
M E 219, 250, 351;
Three of M E 353, 354, 452, 456, 459,
469, 557, 563.

Group D
E&CE 123, 126;
Five of E&CE 208, 231, 262, 332, 342
371, 380, 411, 412, 435, 436
438, 443.

Group E
E&CE 123, 126, 261, 262, 371, 380;
One of E&CE 342, 463, 465, 481, 482.

Honours Applied Mathematics with Physics Electives

In conjunction with the common degree requirements in Table I on page 13:8 this program has the same course requirements as Honours Applied Mathematics, with the following additional specific courses required in the non-math component of the program:

Six half-credits in the physical sciences, normally selected from:
PHYS 252 Electricity and Magnetism 1
PHYS 253 Electricity and Magnetism 2
PHYS 256 Geometrical and Physical Optics
PHYS 263 Classical Mechanics 1
PHYS 275 Astrophysics 1 – The Solar System
PHYS 358 Thermodynamics
PHYS 359 Statistical Mechanics
PHYS 375 Astrophysics 2 – Stellar Astronomy
PHYS 380 Molecular Biophysics
PHYS 480 Radiation Biophysics
CHEM 123 Chemical Reactions, Equilibria, Kinetics
CHEM 124 Organic Chemistry

Honours 'X' with Applied Mathematics Minor

See page 13:7 for a complete description of Minor program requirements.

All of
AM 231 Calculus 4
AM 251 Modelling with Systems of Ordinary Differential Equations
AM 343 Discrete Models in Applied Mathematics
AM 351 Ordinary Differential Equations
AM 353 Partial Differential Equations 1
AM 451 Introduction to Dynamical Systems

Two additional 300- or 400-level AM half-credits.

Combinatorics and Optimization

Combinatorics is the study of discrete structures and their properties. It includes coding theory, combinatorial design, enumeration theory, graph theory and polyhedral theory. Many modern scientific advances have employed combinatorial structures to model the physical world, and recent advances in computational technology have made such investigations feasible. In particular, since computers process discrete data, Combinatorics has become indispensable to Computer Science.
 Optimization, or mathematical programming, is the study of maximizing and minimizing functions subject to specified boundary conditions or constraints. The functions to be optimized arise in engineering, the physical and management sciences, and in various branches of mathematics. With the emergence of computers, Optimization experienced a dramatic growth as a mathematical theory, enhancing both Combinatorics and classical analysis. In its applications to engineering and management sciences, Optimization forms an important part of the discipline of Operations Research.

Both Combinatorics and Optimization have long been special interests of Canadian mathematicians. Indeed, Waterloo was the first university in the world to have a Department of Combinatorics and Optimization, and it continues to be a leading centre for teaching and research in the theories and applications of these disciplines.

Honours Combinatorics and Optimization

In conjunction with the common degree requirements in Table I on page 13:8, this program requires at least 26 math half-credits. These overall requirements must include the Faculty core courses outlined in Table II on page 13:10 and the following specific courses:

All of
C&O 230 Introduction to Combinatorics
C&O 350 Linear Programming

One of
C&O 330 Combinatorial Enumeration
C&O 342 Graph Theory 1

One of
C&O 351 Network Flow Theory
C&O 367 Nonlinear Programming

Three additional half-credits chosen from:
C&O 330 Combinatorial Enumeration
C&O 331 Coding Theory
C&O 342 Graph Theory 1
C&O 343 Graph Theory 2
C&O 351 Network Flow Theory
C&O 357 Nonlinear Programming
C&O 430-466

All of
PMATH 336 Introduction to Group Theory

Two of
AM/PMATH 331 Real Analysis
AM/PMATH 332 Complex Analysis
PMATH 334 Introduction to Rings and Fields
(AM/PMATH 331 may be replaced by one of AM 341/CS 337, CS 372, 374)

Honours ‘X’ with Combinatorics and Optimization Minor

See page 13:7 for a complete description of Minor program requirements.

All of
C&O 230 Introduction to Combinatorics
C&O 350 Linear Programming

One of
C&O 330 Combinatorial Enumeration
C&O 342 Graph Theory 1

Two additional half-credits chosen from:
C&O 330 Combinatorial Enumeration
C&O 331 Coding Theory
C&O 342 Graph Theory 1
C&O 343 Graph Theory 2
C&O 351 Network Flow Theory
C&O 357 Nonlinear Programming
C&O 430-466

OPERATIONS RESEARCH

Operations Research is the field of mathematics that deals with the problems of management in business and government. It involves constructing mathematical models of complex real world situations and then applying sophisticated techniques to these models in order to make optimal, or near optimal, decisions. The three major components of the discipline of Operations Research are Optimization, Statistics and Computer Science.
The Honours program in Operations Research, which is administered by the Division of Mathematics for Industry and Commerce in conjunction with the Department of Combinatorics and Optimization, combines a solid foundation in mathematics with special sequences of courses in economics, business and management science. The mathematics portion of the program includes linear programming, modelling, scheduling, game theory, forecasting, decision theory and computer simulation.

In Canada, employers of Operations Research graduates are found in manufacturing, distribution and retail companies, mining, transportation, banking, health services, education, and government agencies. Students proceeding to a Master’s of Business Administration degree (MBA) will find that a degree in mathematics, emphasizing Operations Research, together with relevant work-term experience, is an excellent preparation for a rewarding career.

Honours Operations Research
In conjunction with the common degree requirements in Table I on page 13:8, this program requires at least 26 math half-credits, of which at least four must be 400-level math half-credits. These overall requirements must include the Faculty core courses outlined in Table II on page 13:10 and the following specific courses:

<table>
<thead>
<tr>
<th>All of</th>
<th>Mathematics</th>
</tr>
</thead>
<tbody>
<tr>
<td>C&amp;O 350</td>
<td>Linear Programming</td>
</tr>
<tr>
<td>C&amp;O 351</td>
<td>Network Flow Theory</td>
</tr>
<tr>
<td>C&amp;O 370</td>
<td>Deterministic OR Models</td>
</tr>
<tr>
<td>CS 230</td>
<td>Introduction to Computers and Computer Systems</td>
</tr>
<tr>
<td>AM 341/CS 337</td>
<td>Introduction to Numerical Analysis</td>
</tr>
<tr>
<td>CS 437</td>
<td>Simulation by Computer</td>
</tr>
<tr>
<td>STAT 331</td>
<td>Applied Linear Models</td>
</tr>
<tr>
<td>STAT 333</td>
<td>Applied Probability</td>
</tr>
<tr>
<td>STAT 371</td>
<td>Stochastic OR Models</td>
</tr>
<tr>
<td>STAT 443</td>
<td>Forecasting</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Four of</th>
<th>Computer Science</th>
</tr>
</thead>
<tbody>
<tr>
<td>C&amp;O 230</td>
<td>Introduction to Combinatorics</td>
</tr>
<tr>
<td>C&amp;O 342</td>
<td>Graph Theory 1</td>
</tr>
<tr>
<td>C&amp;O 367</td>
<td>Nonlinear Programming</td>
</tr>
<tr>
<td>C&amp;O 450 - 466</td>
<td></td>
</tr>
<tr>
<td>CS 334</td>
<td>Data Types and Structures</td>
</tr>
<tr>
<td>CS 432</td>
<td>Business Systems Analysis</td>
</tr>
<tr>
<td>STAT 332</td>
<td>Sampling</td>
</tr>
<tr>
<td>STAT 335</td>
<td>Statistical Process Control</td>
</tr>
<tr>
<td>STAT 430</td>
<td>Experimental Design</td>
</tr>
<tr>
<td>STAT 433</td>
<td>Stochastic Processes</td>
</tr>
</tbody>
</table>

| One of | | |
|--------| | |
| AM/PMA 331 | Real Analysis |
| AM/PMA 332 | Complex Analysis |
| AM 351 | Ordinary Differential Equations |
| PMATH 336 | Introduction to Group Theory |

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Mathematics

Combinatorics and Optimization

One pair chosen from
- M SCI 211 Organizational Behaviour 1
- M SCI 311 Organizational Behaviour 2
or
- PSYCH 101 Introductory Psychology
- PSYCH 338 Organizational Psychology
or
- SOC 101 Introduction to Sociology
- SOC 242 Industrial Sociology

Two of
- ACC 121 Understanding and Using Financial Accounting Information
- ACC 122 Understanding and Using Managerial Accounting Information
- ECON 101 Introduction to Micro Economics
- ECON 102 Introduction to Macroeconomics
- M SCI 461 Managerial and Engineering Economics 2

Two of
- ACC 371 Managerial Finance 1
- BUS 352W Marketing I
- M SCI 432 Introduction to Production Management

Recommended
- DRAMA 223 Speech Communication 1

(BUS 352W is offered by Wilfrid Laurier’s School of Business and Economics. It is described by title on page 13:24.)

Students enrolled in a Double Honours program in Computer Science and Operations Research must replace the Computer Science courses listed above with the equivalent courses required by Honours Computer Science Major students.

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Computer Science

Computer Science is centred around the study of information. It is concerned with the nature and properties of information, its structure and classification, its storage and retrieval, and the various types of processing to which it can be subjected. It is also concerned with the physical machines that perform these operations, with the elemental units of which these machines are composed, with the organization of these units into efficient information processing systems, and with the exploration of the limits of the abilities of these machines.

Computer Science is recognized as an independent discipline with an inherently mathematical nature. Its activity ranges from theoretical areas such as the theory of automata, system organization and logic design, formal languages and computability theory to applied areas such as scientific computing, programming languages, software management and computer systems.
The advent of the computer has facilitated a systems approach to solving many problems in science, business and industry. There is currently a great demand for information analysts to define how systems will perform these functions and for programmers to implement production systems on computers.

The Computer Science program at Waterloo is designed to prepare students for the challenges of a career in this rapidly evolving technological environment. Considerable emphasis is placed on learning fundamental principles throughout the program. As well, students have the opportunity to explore the ways in which these principles are exploited in both current practice and likely future developments.

Admission to Computer Science Major Programs
Students interested in Computer Science Major programs will normally be admitted to these programs at the beginning of their second year.

The phrase "Computer Science Major programs" includes Honours Computer Science, Honours Co-op Computer Science with Electrical Engineering Electives, Honours Co-op Computer Science/Information Systems Option, and all Joint or Double Honours BMath programs involving Computer Science as one of the explicitly designated major areas of study.

There will be approximately 300 positions available each year for new Computer Science Majors, comprising approximately 120 admissions from each of the two Co-op streams and 60 from the Regular stream. However, these numbers are always subject to change, depending upon the overall mix of Co-op and Regular students in Year One Mathematics. In recent years, because sufficient places have been available to meet student demand, it has been possible to admit all students who are eligible to take CS 241 into the Computer Science Major program of their choice.

All Computer Science Major programs require CS 241 and 242, so students must be eligible to enrol in these courses in order to complete a Computer Science Major program. The prerequisites for CS 241 include a 60% all-inclusive cumulative math average. Students who wish to enrol in a Computer Science Major program must preregister with a Computer Science advisor and select one of the Computer Science Major programs when preregistering for CS 241.

The possibility of late admission to a Computer Science Major program will not be completely eliminated. Students may apply for late admission by seeing a Computer Science advisor. Admission will be based on the student's academic record.

A student in a Computer Science Major program whose all-inclusive cumulative Overall or Math average at the end of any term is below 60% must ensure that both averages are at least 60% at the end of each subsequent academic term. Failure to re-establish and maintain these averages at a level of 60% or above will normally result in the student's being required to withdraw from Computer Science. (Required withdrawal from Computer Science does not necessarily imply required withdrawal from Honours Mathematics, nor does it disqualify a student from taking Computer Science courses in the non-specialist stream.)

Honours Computer Science
In conjunction with the common degree requirements in Table I on page 13:8, this program requires at least 25 math half-credits. A maximum of six CS half-credits at the 400 level may be included in the 40 half-credits presented for a degree. These overall requirements must include the Faculty core courses outlined in Table II on page 13:10 and the following specific courses:

All of
CS 241 Principles of Computer Science 3
CS 242 Principles of Computer Science 4
CS 340 Data Structures and Algorithms
CS 351 Digital Design and Architecture
CS 354 Software Systems
CS 360 Introduction to the Theory of Computing

One of
CS 372 Introduction to Scientific Computation: Numerical Linear Algebra
CS 374 Introduction to Scientific Computation: Numerical Approximation

One of
CS 457 Queueing Models: Analysis, Simulation, and Computer Applications
CS 462 Formal Languages and Parsing
CS 464 Computational Complexity Theory
CS 466 Algorithm Design and Analysis
CS 472 Numerical Linear Algebra
C&O 458/CS 473 Numerical Linear Programming
AM 441/CS 476 Numerical Solution of Differential and Integral Equations
CS 487 Introduction to Symbolic Computation

Two additional 400-level CS half-credits chosen from
CS 440 - 498

All of
C&O 230 Introduction to Combinatorics

Four of
ACTSC 232 Introduction to Actuarial Mathematics
AM 231 Calculus 4
AM 250 Modelling with Ordinary Differential Equations
AM/PMATH 331 Real Analysis
AM/PMATH 332 Complex Analysis
AM 351 Ordinary Differential Equations
C&O 330 Combinatorial Enumeration
C&O 342 Graph Theory 1
C&O 350 Linear Programming
PMATH 330 Introduction to Mathematical Logic
PMATH 334 Introduction to Rings and Fields
PMATH 336 Introduction to Group Theory
STAT 333 Applied Probability
STAT 433 Stochastic Processes

Joint Honours Computer Science and 'X'
See page 13:7 for a complete description of Joint program requirements.

All of
CS 241 Principles of Computer Science 3
CS 242 Principles of Computer Science 4
CS 340 Data Structures
Two of
CS 351 Digital Design and Architecture
CS 354 Software Systems
CS 360 Introduction to the Theory of Computing
CS 372 Introduction to Scientific Computation: Numerical Linear Algebra
CS 374 Introduction to Scientific Computation: Numerical Approximation
Two additional 400-level CS-half credits chosen from CS 440-498

Honours Computer Science with Electrical Engineering Electives (Co-operative only)
In conjunction with the common degree requirements in Table I on page 13:8, this program requires at least 25 math half-credits. A maximum of six CS half-credits at the 400 level may be included in the 40 half-credits presented for a degree. These overall requirements must include the Faculty core courses outlined in Table II on page 13:10 and the following specific courses:

All of
CS 241 Principles of Computer Science 3
CS 242 Principles of Computer Science 4
CS 340 Data Structures and Algorithms
CS 354 Software Systems
CS 360 Introduction to the Theory of Computing
One of
CS 372 Introduction to Scientific Computation: Numerical Linear Algebra
CS 374 Introduction to Scientific Computation: Numerical Approximation
Two of
CS 450 Computer Architecture
CS 452 Real-time Programming
CS 454 Distributed Systems

Mathematics
Computer Science

CS 457 Queueing Models: Analysis, Simulation, and Computer Applications

One additional 400-level CS half-credit chosen from CS 440 - 498

All of
C&O 230 Introduction to Combinatorics

Four of
ACTSC 232 Introduction to Actuarial Mathematics
AM 231 Calculus 4
AM 250 Modelling with Ordinary Differential Equations
AM/PMATH 331 Real Analysis
AM/PMATH 332 Complex Analysis
AM 351 Ordinary Differential Equations
C&O 330 Combinatorial Enumeration
C&O 342 Graph Theory 1
C&O 350 Linear Programming
PMATH 330 Introduction to Mathematical Logic
PMATH 334 Introduction to Rings and Fields
PMATH 336 Introduction to Group Theory
STAT 333 Applied Probability
STAT 433 Stochastic Processes

All of
E&CE 123 Electrical Engineering Circuits
E&CE 208 Electronic Circuit Analysis
E&CE 222 Digital Computers
E&CE 223 Digital Circuits and Systems
E&CE 333 Microelectronic Circuits and Devices
E&CE 427 Digital Systems Engineering

Recommended
E&CE 438 Switching and Digital Circuits

Honours Computer Science - Information Systems Option (Co-operative only)
This program is offered jointly with the Division of Mathematics for Industry and Commerce. In conjunction with the common degree requirements in Table I on page 13:8, this program requires at least 24 math half-credits. A maximum of six CS half-credits at the 400 level may be included in the 40 half-credits presented for a degree. These overall requirements must include the Faculty core courses outlined in Table II on page 13:10 and the following specific courses:

All of
CS 241 Principles of Computer Science 3
CS 242 Principles of Computer Science 4
CS 340 Data Structures and Algorithms
CS 364 Software Systems
CS 360 Introduction to the Theory of Computing
CS 448 Introduction to Database Management
CS 482 Techniques in Systems Analysis
Two additional 400-level CS half-credits chosen from CS 440 - 498

All of
C&O 230 Introduction to Combinatorics
Two of
C&O 342  Graph Theory 1
C&O 350  Linear Programming
C&O 370  Deterministic OR Models
STAT 331  Applied Linear Models
STAT 332  Sampling
STAT 333  Applied Probability
STAT 371  Stochastic OR Models

All of
ACC 121  Understanding and Using Financial Accounting Information
ACC 122  Understanding and Using Managerial Accounting Information
BUS 111W  Introduction to Business Organization
BUS 121W  Functional Areas of the Organization
BUS 362W  Marketing I
BUS 481W  Business Policy I
BUS 491W  Business Policy II
ECON 101  Introduction to Micro Economics
ECON 102  Introduction to Macro Economics
M SCI 211  Organizational Behaviour 1
M SCI 311  Organizational Behaviour 2
M SCI 432  Introduction to Production Management
MTHEL 100  Commercial and Business Law for Mathematics Students

Recommended
DRAMA 223  Speech Communication 1

Courses labelled BUS are offered by Wilfrid Laurier’s School of Business and Economics. They are described by title on page 13:24.

Joint Honours Mathematics/Business Administration with Computer Science, Chartered Accountancy with Computer Science (Co-operative only) or Management Accounting with Computer Science (Co-operative only)
These programs are described with the Mathematics/Business Administration, Chartered Accountancy and Management Accounting Options on pages 13:25 and 13:26.

Honours ‘X’ with Computer Science Minor
See page 13:7 for a complete description of Minor program requirements.

All of
CS 131  Principles of Computer Science 1
CS 132  Principles of Computer Science 2

One of
CS 230  Introduction to Computers and Computer Systems
CS 241  Principles of Computer Science 3

Five additional CS half-credits.

Mathematics
Computer Science
Pure Mathematics

Note
Please consult Note 2 on page 13:29 for course-selection advice to students seeking a Computer Science Minor.

Notes
1. Honours students in faculties other than Mathematics wishing a “Minor” in Computer Science should consult the section “Combination Honours Programs Leading to a Degree with Another Faculty” described on page 13:28.

Pure Mathematics

Pure Mathematics may be studied for the satisfaction it provides, as well as for its potential to be useful. A mastery of such subjects as algebra, analysis and geometry is essential, not only to prospective algebraists, analysts and geometers, but also to those who have in mind applications to the basic sciences or technology. Thus, the programs of the Department are designed for students who relish mathematics, as well as for those who wish to get a solid foundation with a view to applying their knowledge.

Some graduates of Pure Mathematics do go out into industry. Others enter the field of education, from primary to advanced levels. A good number commit themselves to research, either in Pure Mathematics itself, or in some other scientific field. We hope to impart in our students the abilities to think clearly, and to educate themselves, so that they may succeed in their fields of endeavour.

The special interests of the Department include algebra (groups, rings, representation theory, lattices, universal algebra, linear algebra), analysis (integration theory, real and complex functions, functional analysis, operator theory, non-linear problems), geometry (algebraic topology, homotopy, differential geometry, projective geometry), number theory (primes, Diophantine approximation), functional equations (with applications to information theory, probability, engineering, science and social science), logic and foundations (model theory, consistency, recursive functions).

The Department offers several programs (see page 13:7). A more detailed description of the Department and its programs may be found in the Pure Mathematics Undergraduate Handbook, available upon request.

Honours Pure Mathematics

In conjunction with the common degree requirements in Table I on page 13:8, this program requires at least 26 math half-credits. These overall requirements must
include the Faculty core courses outlined in Table II on page 13:10 and the following specific courses:

All of
- PMATH 343 Abstract Algebra 1
- PMATH 344 Abstract Algebra 2
- PMATH 351 Real Analysis
- PMATH 352 Complex Analysis
- PMATH 353 Fourier Analysis
- PMATH 367 Set Theory and General Topology

One of
- PMATH 441 Algebraic Number Theory
- PMATH 444 Non-Commutative Algebra
- PMATH 446 Group Theory
- PMATH 448 Commutative Algebra

One of
- PMATH 451/AM 431 Measure and Integration
- PMATH 452 Topics in Complex Analysis
- PMATH 453/AM 432 Functional Analysis

Three additional 400-level PMATH half-credits.

All of
- C&O 230 Introduction to Combinatorics

Two additional 400-level math half-credits

Joint Honours Pure Mathematics and 'X'

See page 13:7 for a complete description of Joint program requirements.

All of
- PMATH 343 Abstract Algebra 1
- PMATH 344 Abstract Algebra 2
- PMATH 351 Real Analysis
- PMATH 352 Complex Analysis

One of
- PMATH 353 Fourier Analysis
- PMATH 367 Set Theory and General Topology

Three additional 400-level PMATH half-credits

One additional 300- or 400-level PMATH half-credit

Note: The following requirements and recommendations also apply for the Joint Honours partners indicated:
1. AM: PMATH 353 required; PMATH 451, 453 strongly recommended
2. C&O: PMATH 444, 446, 448 at least one is strongly recommended
3. CS: PMATH 432 required; PMATH 444, 446, 448 at least one is strongly recommended
4. STAT: PMATH 451 required

Honours 'X' with Pure Mathematics Minor

See page 13:7 for a complete description of Minor program requirements.

Mathematics
Pure Mathematics
Statistics

All of
- PMATH 344 Abstract Algebra 2
- PMATH 351 Real Analysis
- PMATH 352 Complex Analysis

Three additional 300- or 400-level PMATH half-credits.

Statistics

Statistics is the branch of modern applied mathematics which deals with the collection and analysis of data. Statistical methods are extensively used in Biology, Medicine, Health Sciences, Agriculture, Business, Economics, Engineering, and many other fields. Claims based on statistical arguments appear daily in the press, and it is difficult to assess these intelligently without some knowledge of statistical methods.

The statistician's first job is to determine what data to collect, and how to collect it so that it will be without bias or distortion. These problems are dealt with in the Design of Experiments and Sample Surveys. Statistical Inference is concerned with inferring what the population is like on the basis of a small amount of data (the sample). The link between population and sample is provided by Probability Theory, which forms an important part of the Statistics curriculum. Often the purpose of collecting data is to assist in reaching a decision, so the field of Decision Theory is also a part of Statistics.

Many other areas of pure and applied mathematics find applications in Statistics. Calculus and linear algebra are used extensively in the undergraduate program; abstract algebra, combinatorics, difference and differential equations, analysis, and measure theory are required in more advanced work. Most statistical analyses involve the computer, so a good background in computing is highly desirable.

Honours Statistics

In conjunction with the common degree requirements in Table I on page 13:8, this program requires at least 26 math half-credits. A maximum of ten STAT half-credits at the 300- or 400-level may be included in the 40 half-credits presented for a degree. These overall requirements must include the Faculty core courses outlined in Table II on page 13:10 and the following specific courses:

All of
- STAT 330 Statistical Theory and Methods
- STAT 331 Applied Linear Models
- STAT 332 Sampling
- STAT 333 Applied Probability
- STAT 430 Experimental Design
- STAT 450 Estimation and Hypothesis Testing

One additional 400-level STAT half-credit
Four of:
- ACTSC 431 Risk Theory
- ACTSC 432 Loss Distributions and Credibility Theory
- AM/PMATH 331 Real Analysis
- AM/PMATH 332 Complex Analysis
- AM 351 Ordinary Differential Equations
- AM 353 Partial Differential Equations
- AM 451 Introduction to Dynamical Systems
- C&O 330 Combinatorial Enumeration
- C&O 350 Linear Programming
- AM 341/CS 337 Introduction to Numerical Analysis
- PMATH 334 Introduction to Rings and Fields
- PMATH 353 Fourier Analysis
- PMATH 452 Topics in Complex Analysis

Three additional 300- or 400-level math half-credits.

Joint Honours Statistics and 'X'
See page 13:7 for a complete description of Joint program requirements.

All of:
- STAT 330 Statistical Theory and Methods
- STAT 331 Applied Linear Models
- STAT 333 Applied Probability
- STAT 450 Estimation and Hypothesis Testing

One additional 300-level STAT half-credit.

Two additional 400-level STAT half-credits.

Two additional 300- or 400-level math half-credits not included among the courses used to satisfy the requirements of the other Joint Honours department.

Honours Applied Statistics with Engineering Electives (Co-operative only)
The requirements for this program include those for the Honours Statistics program described above. In addition, the non-math half-credits must include one of the groups of Engineering courses listed below. Where necessary, PHYS 121/122 and CHEM 123/124 should normally be taken in Year One. The Engineering courses are taken in Years Two to Four.

Group:
- Chemical
  - CHEM 021, 026, 031, 037, 041; PHYS 121/122.
- Civil (transportation)
  - CIV 126, 292, 340, 342, 343, 344; PHYS 121/122.
- Groups of courses in Fluid Mechanics and Hydrowlogy and Water Quality Control are also available*.

Management Sciences
- M SCI 211, 261, 311, 432, 452, 461.

Mathematics
- Inter-Departmental Program

Mechanical

Groups of courses in Automation, Production, Materials, Solid Body Mechanics and Thermo fluids are also available*.

Systems Design
- SY DE 281, 384, 432, 544, 555; PHYS 121/122.

*Details are available in the Statistics Undergraduate Studies Handbook.

Note
An Option in Statistics for students in the Faculty of Engineering is described on page 10:11.

Honours ‘X’ with Statistics Minor
See page 13:7 for a complete description of Minor program requirements.

Three of:
- STAT 330 Statistical Theory and Methods
- STAT 331 Applied Linear Models
- STAT 332 Sampling
- STAT 333 Applied Probability

Two additional 300- or 400-level STAT half-credits.

Inter-Departmental Program
The purpose of this program is to provide students in the Faculty of Mathematics with breadth of studies at the Honours level rather than the specialization offered by departmental and option Honours programs. Further, it permits a student to defer a decision as to specialization or affiliation with a particular department or option within the Faculty.

Students taking this program will be prepared for careers in the applications of mathematics. In addition, by choosing appropriate courses, a student may be eligible to proceed from this program to graduate work in some areas of the mathematical sciences.

Honours Mathematics: Inter-Departmental Program
In conjunction with the common degree requirements in Table I on page 13:8, this program requires at least 26 math half-credits. The 300- and 400-level math half-credits presented for a degree may not include more than six with the same prefix. These overall requirements must include the Faculty core courses outlined in Table II on page 13:10 and the following specific courses:

All of:
- AM 250 Modelling with Ordinary Differential Equations
Mathematics/Teaching Option

The Co-operative Mathematics Teaching Option is an integrated program offered jointly by the Faculty of Mathematics at the University of Waterloo and the Faculty of Education at the University of Western Ontario. This program combines an academic program in mathematics, teaching experience in secondary schools, and professional training, with the graduate fully qualified as a secondary school mathematics teacher in Ontario.

Mathematics
Inter-Departmental Program
Teaching Option

Students interested in the program should enrol in any of the Mathematics Faculty’s non-teaching Co-operative Programs in Year One, and will be considered for admission to the Teaching Option in Year Two on the basis of two interviews and satisfactory academic and work-term performance.

Work-term arrangements in this Option differ from other Co-operative programs because of the nature of the program. (Consult the Work-Study Sequence Chart on page 5.4.) Details concerning this and the Faculty of Education component are available from the Academic Advisors or the Co-ordinator for this Option.

Honours Mathematics/Teaching Option
(Co-operative only)

In conjunction with the common degree requirements in Table I on page 13.8, this program requires at least 24 math half-credits. The math half-credits submitted for the degree must include at least eight 300- or 400-level math half credits, and students are encouraged to gain as much mathematical breadth as possible. These overall requirements must include the Faculty core courses outlined in Table II on page 13:10 and the following specific courses:

All of
AM 231 Calculus 4
AM/PMATH 331 Real Analysis
AM/PMATH 332 Complex Analysis

Two of
AM 435 Applications of Algebra
C&O 330 Combinatorial Enumeration
PMATH 334 Introduction to Rings and Fields
PMATH 336 Introduction to Group Theory
STAT 340 Experimental Design

Two additional 400-level math half-credits with 300-level prerequisites.

Note
Students in the Faculty Inter-Departmental Honours program may not pursue a Minor designation or Joint/Double Honours program within the Faculty of Mathematics. However, they are encouraged to pursue a Minor or Joint Honours program with an academic area in another faculty.

Mathematics/Teaching Option

The Co-operative Mathematics Teaching Option is an integrated program offered jointly by the Faculty of Mathematics at the University of Waterloo and the Faculty of Education at the University of Western Ontario. This program combines an academic program in mathematics, teaching experience in secondary schools, and professional training, with the graduate fully qualified as a secondary school mathematics teacher in Ontario.
One of
PMATH 334 Introduction to Rings and Fields
PMATH 336 Introduction to Group Theory

One of
PMATH 330 Introduction to Mathematical Logic
PMATH 340 Elementary Number Theory
PMATH 360 Geometry

One of
STAT 331 Applied Linear Models
STAT 332 Sampling
STAT 333 Applied Probability

All of
MTHEL 206A Introduction to Mathematics Education
SOC 207 Sociology of Education

Recommended non-math half-credits include:
PSYCH 212 Educational Psychology
PSYCH 213 Exceptional Children
PHIL 311 Philosophy of Education 1
PHIL 312 Philosophy of Education 2
MTHEL 102 Uses and Abuses of Statistics

Notes
1. Successful completion of the academic requirements for any of the Departmental Honours programs 'X' in the Faculty of Mathematics will be accepted as a replacement for the course requirements listed above. Students who elect this option will be designated by a program label such as "Honours 'X'/Teaching Option" rather than "Honours Math/Teaching Option". (Since 3B and 4B courses are not normally offered in the Spring term, it will be difficult to satisfy this alternative.)

2. The Bachelor of Education requirements are completed during a four-month academic term at the Faculty of Education at the University of Western Ontario in London. This term occurs after all other components of the program have been completed.

3. The selection of courses required for the BMath Teaching Option must include a second teaching subject in one of the following disciplines:
Biology, Chemistry, Computer Science, Environmental Studies, General Science, or Physics. Six half-credits are required to qualify for a second teaching subject, except for Computer Science, which requires only four half-credits.

Division of Mathematics for Industry and Commerce

The Division of Mathematics for Industry and Commerce (DMIC) was formed within the Faculty of Mathematics to deal with activities of the Faculty that relate closely to business and industry. Innovative programs have been developed which combine a University education with substantial amounts of corporate experience.

The DMIC manages five industry and commerce-related programs within the Faculty of Mathematics which lead to a BMath Honours degree:
1. Business Administration
2. Chartered Accountancy
3. Management Accounting
4. Computer Science – Information Systems
5. Operations Research

The Division has two main objectives with respect to these undergraduate programs:

a) To provide a comprehensive education in modern mathematics and related subjects. This will provide the basis for a successful career in a competitive, highly technical world.

b) To provide a set of skills which will enable graduates to rapidly become effective, productive members of the business community.

In addition, the Division serves as a focal point for contact between faculty members and the industrial and commercial sector. Members of the DMIC are drawn from existing departments within the Faculty of Mathematics. There is also representation from the School of Accountancy (Arts), the Department of Co-operative Education and Career Services, and the Department of Management Sciences (Engineering), as well as areas of business and commerce. Advice and guidance is provided by members of the Waterloo Advisory Council whose membership includes prominent executives from leading industries, the financial sector, business and government.

BUSINESS ADMINISTRATION, CHARTERED ACCOUNTANCY AND MANAGEMENT ACCOUNTING OPTIONS

The constantly increasing complexity of business organizations has created a demand for persons trained in analyzing business and accounting problems from a mathematical point of view. The Faculty of Mathematics, in co-operation with the Division of Mathematics for Industry and Commerce, the School of Business and Economics at Wilfrid Laurier University, the Departments of Economics and Management Sciences, and the School of Accountancy at Waterloo offers three unique programs combining Mathematics with Business Administration, Chartered Accountancy, and Management Accounting. Each of these is designed so that students gain an appreciation for the applications of mathematics to commerce and gain experience in areas such as banking, marketing, production control, accounting, auditing, etc. All three Options are available, at the Honours level only, in the Co-operative system of study. Only the Business Administration Option, however, is available in the Regular system of study.
The Chartered Accountancy and Management Accounting Options are offered in co-operation with the Institute of Chartered Accountants of Ontario and the Society of Management Accountants of Ontario, respectively. Graduates of the Chartered Accountancy Option will normally have completed most formal university course work required by the Institute. The other principal requirements for the CA designation include two or three years work experience in public accounting and successful completion of the National Institute's Uniform Final Examinations. The Management Accounting Option is structured so that successful completion of the program normally qualifies a student for most CMA exemptions.

Co-operative work terms are accepted by both the Institute and the Society as part of their respective internship requirements. Co-op students are able to complete the remaining Institute or Society requirements after graduation.

**Note**

In the requirements and recommendations which follow, courses with prefix BUS are offered by Wilfrid Laurier University's School of Business and Economics. These courses are:

- BUS 111W - Introduction to Business Organization
- BUS 121W - Functional Areas of the Organization
- BUS 352W - Marketing I
- BUS 362W - Marketing II
- BUS 454W - Personnel Management
- BUS 481W - Business Policy I
- BUS 491W - Business Policy II

Complete course descriptions, and the terms in which these courses are normally offered for University of Waterloo students, can be found in the "How To Get Around in MATHEMATICAL CIRCLES" booklet, copies of which are available in the Mathematics Undergraduate Office (MC 5115).

**Honours Mathematics/Business Administration, Chartered Accountancy (Co-operative only), Management Accounting (Co-operative only) Options**

In conjunction with the common degree requirements in Table I on page 13:8, each of these programs requires at least 20 math half-credits. These overall requirements must include the Faculty core courses outlined in Table II on page 13:10 and one of the math course packages a), b), c) listed below. The non-math component of each of these programs must also include the specific courses listed following package c).

On entering Year Three, students must specify one of packages a), b), c) below:

**a) Information Systems Package**

All of

- CS 230 Introduction to Computers and Computer Systems
- CS 330 Management Information Systems

**Mathematics**

**Industry and Commerce**

- CS 338 Computer Applications in Business: Databases
- CS 432 Business Systems Analysis

One additional 300- or 400-level CS half-credit

Two of

- AM 381C/PMath 380A Introduction to Information Theory
- C&O 350 Linear Programming
- C&O 367 Nonlinear Programming
- C&O 454 Scheduling

All of

- STAT 331 Applied Linear Models

One of

- STAT 332 Sampling
- STAT 333 Applied Probability
- STAT 335 Statistical Process Control
- STAT 443 Forecasting

One additional 300- or 400-level math half-credit.

**b) Optimization Package**

All of

- C&O 350
- C&O 351 Network Flow Theory
- C&O 370 Deterministic OR Models

Two of

- C&O 367 Nonlinear Programming
- C&O 450 Combinatorial Optimization
- C&O 452 Integer Programming
- C&O 454 Scheduling
- C&O 456 Game Theory
- C&O 459 Topics in Optimization
- C&O 464 Quadratic Programming
- C&O 466 Continuous Optimization

All of

- CS 330 Management Information Systems
- CS 338 Computer Applications in Business: Databases
- STAT 331 Applied Linear Models

One of

- STAT 332 Sampling
- STAT 333 Applied Probability
- STAT 335 Statistical Process Control
- STAT 443 Forecasting

One additional 300- or 400-level math half-credit.

**c) Statistics Package**

All of

- STAT 331 Applied Linear Models
- STAT 332 Sampling
- STAT 335 Statistical Process Control
- STAT 443 Forecasting
Mathematics
Industry and Commerce

One of
STAT 333  Applied Probability
STAT 430  Experimental Design
STAT 440  Statistical Computing

Two of
C&O 350  Linear Programming
C&O 367  Nonlinear Programming
C&O 370  Deterministic OR Models
C&O 454  Scheduling

All of
CS 330  Management Information Systems
CS 338  Computer Applications in Business: Databases

One additional 300- or 400-level math half-credit.

The following courses are recommended for all three packages a), b), c) above:
ACTSC 231  Mathematics of Finance
C&O 270  Introduction to Optimization
DRAMA 223  Speech Communication 1

Business Administration Option – Non-Math Component
The non-math half-credits required for the Business Administration Option (together with the terms in which these courses are normally taken) are given below:

1A ACC 121  Understanding and Using Financial Accounting Information
BUS 111W  Introduction to Business Organization
1B ACC 122  Understanding and Using Managerial Accounting Information
BUS 121W  Functional Areas of the Organization
2A BUS 352W  Marketing I
ECON 101  Introduction to Micro Economics
2B BUS 362W  Marketing II
ECON 102  Introduction to Macro Economics
MTHHEL 100  Commercial and Business Law for Mathematics Students
3A ACC 371  Managerial Finance 1
M SCI 211  Organizational Behaviour 1
3B ACC 372  Managerial Finance 2
M SCI 311  Organizational Behaviour 2
4A BUS 454W  Personnel Management
BUS 481W  Business Policy I
4B BUS 491W  Business Policy II
M SCI 432  Introduction to Production Management

Accounting Options – Non-Math Component
The non-math half-credits required for the Chartered Accountancy and Management Accounting Options (together with the terms in which these courses are normally taken) are given below:

1A ACC 101  Introductory Accounting
BUS 111W  Introduction to Business Organization
1B BUS 121W  Functional Areas of the Organization
ECON 101  Introduction to Micro Economics
2A ACC 281  Cost Management Systems 1
ECON 102  Introduction to Macro Economics
2B ACC 291  Financial Accounting 1
M SCI 211**  Organizational Behaviour 1
MTHHEL 100  Commercial and Business Law for Mathematics Students
3A ACC 351  Auditing 1
ACC 371  Managerial Finance 1
ACC 392  Financial Accounting 2
3B ACC 372  Managerial Finance 2
ACC 381  Cost Management Systems 2
4A ACC 382  Cost Management Systems 3
ACC 461  Taxation 1
4B ACC 462  Taxation 2
ACC 491  Financial Accounting 3

**M SCI 211 is required only in the Management Accounting Option

Notes
1. ACC 401, 453 are strongly recommended in terms 4A/B of the Accounting Options.

2. In addition to the 60% Math and Overall Graduation Average requirements for an Honours BMath degree, students in the Honours Accounting Options must also achieve an average of at least 70% in all of the courses with the prefix ACC which are explicitly required for their program. (See also Footnote 8(iv) on page 13:9.)

3. The minimum grade required to satisfy a prerequisite for courses with prefix ACC is C-.

Joint Honours Mathematics/Business Administration with Computer Science, Chartered Accountancy with Computer Science (Co-operative only), or Management Accounting with Computer Science (Co-operative only)
In conjunction with the common degree requirements in Table I on page 13:8, each of these programs requires at least 21 math half-credits. These overall requirements must include the Faculty core courses
outlined in Table II on page 13:10 and the specific math courses listed below. The non-math component of each of these programs must also include all the specific non-math half-credits required in the corresponding Honours Mathematics Option, i.e., Mathematics/Business Administration, Chartered Accountancy or Management Accounting, as listed earlier.

All of
- CS 241 Principles of Computer Science 3
- CS 242 Principles of Computer Science 4
- CS 340 Data Structures
- CS 354 Software Systems
- CS 448 Introduction to Database Management
- CS 482 Techniques in Systems Analysis

One of
- CS 351 Digital Design and Architecture
- CS 360 Introduction to the Theory of Computing
- CS 372 Introduction to Scientific Computation: Numerical Linear Algebra
- CS 374 Introduction to Scientific Computation: Numerical Approximation
- CS 440 - 490

Honours Computer Science – Information Systems Option (Co-operative only)
This program is described with Computer Science programs on page 13:10.

Honours Operations Research
This program is described with Combinatorics and Optimization programs on pages 13:15 and 13:16.

Mathematics
Industry and Commerce
Combination Honours Programs

Combination Honours Programs With Other Faculties Leading to the BMath Degree

In the descriptions below, ‘X’ refers to any one of Actuarial Science, Applied Mathematics, Combinatorics and Optimization, Computer Science, Math/Teaching Option, Operations Research, Pure Mathematics, Statistics, or the Faculty Inter-Departmental Honours program. ‘Z’ refers to any discipline, in a faculty other than Mathematics, that chooses to make a ‘Joint Honours’ or a ‘Minor’ designation available to Math Faculty students. Students interested in a particular discipline ‘Z’ should consult with the department concerned for specific course requirements.

Joint Honours ‘X’ and ‘Z’ Programs
All Honours requirements for area ‘X’ and the set of departmental requirements prescribed by discipline ‘Z’ must be satisfied. In addition to meeting the Graduating Average requirements of the Faculty of Mathematics, students in these programs must also satisfy the Honours average requirements specified by discipline ‘Z’. Note that, with some ‘X’ and ‘Z’ combinations, it may be necessary to complete more than 40 half-credits and/or more than eight full-time terms of study to satisfy all of the relevant course requirements.

Honours ‘X’ with ‘Z’ Minor Programs
All Honours requirements for area ‘X’ and a set of ten half-credits prescribed by discipline ‘Z’ must be satisfied. In addition to meeting the Graduating Average requirements of the Faculty of Mathematics, students in these programs must also satisfy any average requirements in these ten half-credits as specified by discipline ‘Z’.

Students do not officially register in an Honours ‘X’ with ‘Z’ Minor program. Such students register in the Honours ‘X’ program and request an official ‘Z’ Minor designation when they complete an ‘Intention to Graduate’ form.

Note
Combination Honours Programs leading to a degree in another faculty (i.e. not BMath) are described on page 13:28.

BMath Transcripts
BMath transcripts include explicit mention of no more than two areas of study in the academic program section.
Three-Year General Program (Regular Only)

In conjunction with the degree requirements in Table I on page 13:8, this program requires a total of 30 half-credits, including at least 15 math half-credits and ten non-math half-credits. These overall requirements must include the specific courses indicated in Table V below.

Table V - Three-Year BMath General Program: Required Year One and Two Faculty Core Courses/Typical Course Loads

<table>
<thead>
<tr>
<th>Term 1A</th>
<th>Term 1B</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 111A</td>
<td>Algebra</td>
</tr>
<tr>
<td>MATH 113A</td>
<td>Calculus 1</td>
</tr>
<tr>
<td>CS 100</td>
<td>Introduction to Computer Usage</td>
</tr>
<tr>
<td>two non-math half-credits</td>
<td></td>
</tr>
<tr>
<td>Term 1B</td>
<td></td>
</tr>
<tr>
<td>MATH 111B</td>
<td>Linear Algebra and Solid Geometry</td>
</tr>
<tr>
<td>MATH 113B</td>
<td>Calculus 2</td>
</tr>
<tr>
<td>CS 102</td>
<td>Introduction to Computer Programming</td>
</tr>
<tr>
<td>two additional half-credits</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Term 2A</th>
<th>Term 2B</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 225</td>
<td>Linear Algebra 2</td>
</tr>
<tr>
<td>MATH 227</td>
<td>Calculus 3</td>
</tr>
<tr>
<td>STAT 220</td>
<td>Introduction to Statistical Methods 1</td>
</tr>
<tr>
<td>two non-math half-credits</td>
<td></td>
</tr>
<tr>
<td>Term 2B</td>
<td></td>
</tr>
<tr>
<td>STAT 221</td>
<td>Introduction to Statistical Methods 2</td>
</tr>
<tr>
<td>four additional half-credits</td>
<td></td>
</tr>
</tbody>
</table>

Terms 3A, 3B combined

additional math half-credits to bring the total to 15
additional non-math half-credits to bring the total to ten
additional half-credits to bring the total to 30

Recommended additional math courses include:

| ACTSC 231 Mathematics of Finance | PMATH 330 Introduction to Mathematical Logic |
| AM 250 Modelling with Ordinary Differential Equations | PMATH 340 Elementary Number Theory |
| AM 343 Discrete Models in Applied Mathematics | PMATH 360 Geometry |
| C&O 220 Introductory Combinatorics | STAT 321 Applied Regression Analysis |
| C&O 270 Introduction to Optimization | STAT 322 Application of Sampling Surveys |
| CS 230 Introduction to Computers and Computer Systems | |
| CS 330 Management Information Systems | |

Footnotes to Table V

1. Table V includes the Year One and Two math courses, in the terms they are normally taken, which are required in the three-year BMath General program. It also includes, for Terms 1A, 1B and 2A, a recommended course-load mix of math vs. non-math courses.

2. The Honours and Advanced courses listed in Tables II and III, on pages 13:10 and 13:11, are not open to students registered in the three-year BMath General program. However, in cases where a student registers in the General program following earlier registrations in an Honours program, any successfully completed Honours or Advanced courses may be substituted, in lieu of the corresponding General required courses in Table V, to satisfy three-year BMath General degree requirements.

Students admitted to the Faculty of Mathematics prior to the Fall/89 term should consult Table IV on page 13:11 re: further potential course substitutions.

3. Depending upon a student's past background in Computer Science prior to entering the program, the Faculty may approve taking CS 102, 212 in lieu of CS 100, 102.

4. The term 'math half-credit' includes courses with prefixes ACTSC (Actuarial Science), AM (Applied Mathematics), C&O (Combinatorics and Optimization), CS (Computer Science), MATH (non-departmental Faculty courses), PMATH (Pure Mathematics), and STAT (Statistics).

The term 'non-math half-credit' refers to courses offered by other faculties, as well as those with the course prefix MTHEL offered by the Faculty of Mathematics.
Post-Degree Diploma in Actuarial Science

This pre-professional Diploma program is directed at holders of a Bachelor’s degree in an area other than Actuarial Science who wish to obtain the background necessary for entry-level employment in the actuarial profession. Instead of completing the standard Ontario Universities Application Centre application-for-admission form normally used for BMath undergraduate degree studies, applicants interested in this Diploma program should contact the Actuarial Science Graduate Officer directly to apply.

Course Requirements
A Post-Degree Diploma in Actuarial Science requires successful completion of eight half-credits, at least six of which must be labelled ACTSC. If equivalent credits have not been earned in the student’s previous baccalaureate program, the following three courses must be included in the six ACTSC half-credits:

- ACTSC 231 Mathematics of Finance
- ACTSC 232 Introduction to Actuarial Mathematics
- ACTSC 331 Life Contingencies – Single Lives

The remaining courses to satisfy the overall Diploma requirements described above must be selected from the following list:

- All ACTSC courses numbered 330 or higher
- STAT 330, 331, 333, 431, 433, 443
- AM 341/CS 337
- MTHEL 305A, 305B

Other courses approved by the Actuarial Science Graduate Officer.

Combination Honours Programs Leading to a Degree With Another Faculty

Joint Honours Programs with Mathematics
A ‘Joint Honours with Mathematics’ is available for Honours students in conjunction with any discipline ‘Z’, in a faculty other than Mathematics, that chooses to make a ‘Joint Honours Z with Mathematics’ designation available to its students. Students interested in a particular discipline should consult with the department concerned for specific course requirements.

The Faculty of Mathematics course requirements consist of a total of 14 math half-credits with a minimum average of 60%. These overall requirements must include the following specific courses:

- All of
  - MATH 135 Algebra
  - MATH 136 Linear Algebra 1
  - MATH 137 Calculus 1

Four additional math half-credits which qualify for BMath degree credit.

Students wishing to specialize in one particular area of mathematics should consult the Undergraduate Officer of the appropriate department in the Faculty of Mathematics for advice in selecting their “additional” math half-credits.

Minor in Mathematics*
A ‘Minor in Mathematics’ is available for Honours students in other faculties. This Minor requires a total of ten math half-credits with a minimum average of 60%. These overall requirements must include the following specific courses:

- All of
  - MATH 135 Algebra
  - MATH 136 Linear Algebra 1
  - MATH 137 Calculus 1
  - MATH 138 Calculus 2

Two of
  - STAT 220 Introduction to Statistical Methods 1
  - STAT 221 Introduction to Statistical Methods 2
  - STAT 321 Applied Regression Analysis
  - STAT 322 Application of Sampling Surveys

Two of
  - CS 100 Introduction to Computer Usage
  - CS 102 Introduction to Computer Programming
  - CS 212 Programming Principles and Practice
  - CS 230 Introduction to Computers and Computer Systems

Two additional math half-credits which qualify for BMath degree credit.

*Students do not officially register for a Mathematics Minor. Such students register in the appropriate Honours program and request an official Mathematics Minor designation when they complete an ‘Intention to Graduate’ form.

Minor in Computer Science
A ‘Minor in Computer Science’ is available for Honours students in faculties other than Mathematics. This Minor requires a total of ten half-credits, with a minimum average of 60%, which must consist of:

- MATH 138 Calculus 2
- MATH 235 Linear Algebra 2
- MATH 237 Calculus 3

All of
- STAT 230 Probability
- STAT 231 Statistics

Two of
- CS 100 Introduction to Computer Usage
- CS 102 Introduction to Computer Programming
- CS 212 Programming Principles and Practice
- CS 230 Introduction to Computers and Computer Systems

Four additional math half-credits which qualify for BMath degree credit.

Students wishing to specialize in one particular area of mathematics should consult the Undergraduate Officer of the appropriate department in the Faculty of Mathematics for advice in selecting their “additional” math half-credits.
One half-credit Calculus course
One half-credit Algebra course

All of

CS 102 Introduction to Computer Programming (or equivalent)
CS 212 Programming Principles and Practice
CS 230 Introduction to Computers and Computer Systems

Five of

CS 330 Management Information Systems
CS 334 Data Types and Structures
CS 336 Distributed Computing Systems
AM 341/CS 337 Introduction to Numerical Analysis
CS 338 Computer Applications in Business: Databases
CS 430 Applications Software Engineering
CS 432 Business Systems Analysis
CS 435 Computer Applications
CS 437 Simulation by Computer

Notes
1. Students do not officially register for a Computer Science Minor. Such students register in the appropriate Honours program and request an official Computer Science Minor designation when they complete an 'Intention to Graduate' form.
2. To assist with course-selection planning for students wishing to select courses from the non-specialist stream in Computer Science, the following list summarizes the courses available each term:

   Fall: CS 330, 334, 338, 430, 432
   Spring: CS 330, 334, 337, 338, 432

The sequences of courses below are recommended for those students who wish to take the maximum two CS courses per term during Years Three and Four. (Other sequences are possible, of course, but they may lead to some terms where there are not two CS courses available for which you are eligible and do not already have credit.)

8-stream Co-op

** 3A (W) – CS 336, 337
3B (F) – CS 334, 430
4A (S) – CS 338, 432
4B (W) – CS 435, 437

4-stream Co-op

** 3B (W) – CS 336, 337
4A (F) – CS 430, 432
4B (W) – CS 435, 437

Regular

3A (F) – CS 330, 334
** 3B (W) – CS 336, 337
4A (F) – CS 430, 432
4B (W) – CS 435, 437

Mathematics
Combination Honours Programs
Recognition of Excellence

* * * 8-stream Co-op students may substitute CS 330 for any course in any term. Regular and 4-stream Co-op students may substitute CS 338 for any course in terms 3B, 4A or 4B.

Recognition of Excellence

1. Alumni Gold Medal
An alumni Gold Medal is presented annually, usually at Spring Convocation, to recognize the academic excellence of the Math Faculty's most outstanding undergraduate student.

2. K.D. Fryer Gold Medal
The K.D. Fryer Gold Medal is presented annually, at Fall Convocation, to a graduating Math student who best exemplifies academic excellence and good student citizenship.

3. J. Alan George Award
The J. Alan George Award is presented annually, at the Math Graduation Ball, to a graduating Math student who best exemplifies student leadership and dedicated involvement in student affairs on campus for the benefit of Math students.

4. Term Dean's Honours List
To recognize outstanding academic achievement each term, the designation "Dean's Honours List" is awarded to undergraduate Math students in an Honours program whose term averages, both Math and Overall, are at least 85%, based on all courses taken that term. Only students carrying a standard course load of five half-credits or more in the term will be eligible for the Dean's Honours List. This designation is reflected on end-of-term grade reports and official University transcripts.

5. Graduating "With Distinction"
In recognition of distinguished academic achievement throughout their undergraduate careers, all students who graduate with a BMath degree, either four-year Honours or three-year General, and have both Math and Overall all-inclusive cumulative averages of at least 80%, based on all courses taken, are eligible to graduate "With Distinction". This notation appears on official University transcripts.

6. Graduating "With Distinction – Dean's Honours List"
In recognition of outstanding academic records throughout their undergraduate careers, all students who graduate with a BMath Honours degree and have both Math and Overall all-inclusive cumulative averages of at least 85%, based on all courses taken, are eligible to graduate "With Distinction – Dean's Honours List". In addition to having this notation appear on their official University transcripts, such students have their names displayed in gold in the Math Faculty Colloquium Room (MC 5158).
Faculty Policies

1. UNDERGRADUATE STANDINGS AND PROMOTIONS COMMITTEE

Membership, Duties, Operating Procedures
The Committee consists of the Dean, Associate Dean for Undergraduate Studies, Associate Dean for Faculty Programs, the Assistant Registrar for the Faculty of Mathematics (who serves as the Committee’s Secretary), the Faculty Advisor for each of the Faculty’s undergraduate programs, a representative of St. Jerome’s College, the Mathematics Program Administrator of Co-operative Education and Career Services, and other non-voting persons.

The main purposes of the Committee are to administer the rules and regulations pertaining to undergraduate studies in the Faculty, to make recommendations on student performance before end-of-term grade reports are issued to students by the Registrar, and to consider all requests for special consideration or petitions in matters within its jurisdiction.

Exceptions to normal Faculty policies under the jurisdiction of the Standings and Promotions Committee may be authorized only by that Committee. Students making such petitions must complete Form D, available from the Registrar’s Office, the Mathematics Undergraduate Office or from their Undergraduate Advisor, and must submit the form together with supporting documentation to the Assistant Registrar, Faculty of Mathematics, Needles Hall. At its meetings the Committee carefully considers all petitions and when special circumstances justify making an exception to existing rules, the Committee grants the request. It is often useful for students to discuss their circumstances with an Undergraduate Advisor before making a formal request to the Committee. Committee meetings are normally scheduled every other week.

2. WITHDRAWAL POLICIES

2.1 Required Withdrawal from Co-op
Students will be required to withdraw from a Co-operative Mathematics program if they fall into one or more of the following categories:

i) They have been required to withdraw from an Honours Mathematics program.
ii) They have failed to meet minimum requirements for work terms and/or work reports.

2.2 Required Withdrawal from Honours
Students will normally be required to withdraw from an Honours Mathematics program if they have accumulated more than six half-credit failures in total.

2.3 Required Withdrawal from Mathematics
Students will normally be required to withdraw from the Faculty of Mathematics if they fall into one or more of the following categories:

i) They have accumulated more than eight half-credit failures in total.

ii) They have accumulated six or more half-credit failures during any two consecutive full-time academic terms (including failures obtained in any part-time terms interspersed between the two full-time terms in question).

iii) They have exceeded the maximum number of course attempts allowed for their degree. (See Table I on page 13:8).

iv) They have failed to satisfy all requirements for a three-year BMath General degree by the end of the first term in which they have accumulated 40 or more half-course attempts.

v) In the opinion of the Standings and Promotions Committee, they are unlikely to profit from further study in the Faculty of Mathematics.

Students who have been required to withdraw as Honours BMath degree candidates will be permitted to register in a three-year BMath General program, provided their records do not meet any of the criteria for ‘Required Withdrawal from Mathematics’ (see Section 2.3 below). Students allowed to continue their studies in the General program will not be permitted to take Honours or Advanced mathematics courses when there are corresponding General courses offered by the Faculty. (See Table with Note 2 on page 16:95 for a complete listing of such courses.)

2.4 Exceeding Maximum Course Attempts/Failures
A student who, at the end of a specific term, has accumulated all the requirements for a particular degree, but has simultaneously exceeded the maximum number of failures or course attempts permitted for the degree in question will not normally be granted the degree. In some cases, depending upon the circumstances, the student might be eligible for a lesser degree. (See the last paragraph in Section 2.3 above.) In other circumstances, however, it is quite possible that the student would be required to withdraw from the Faculty with no degree.
3. GRADING POLICIES

3.1 Grade Designations/Averages
In addition to marks from the numerical scale 0-100, the designations INC (Incomplete course work, no credit granted), AEG (Aegrotat, credit granted due to illness), CR (Credit granted), NCR (No credit granted), WD (Withdraw after the drop deadline - no academic penalty in the Faculty of Mathematics, but counts as a course attempt), NMR (No mark reported) and DNW (Did not write examination, no credit granted) may be used from time to time.

Courses recorded as AEG or CR will count as credits but have no numerical grade for average purposes. Those recorded as INC, NCR, NMR and DNW will count as failures for the purpose of course-attempt and failure counts. If a student abandons a course and does not write the final examination, some instructors may elect to submit a numerical grade based upon term work, with a zero mark included for the examination, rather than submitting a DNW grade for the course. Students considering such action are advised to determine their instructor’s intentions prior to making any final decision to abandon the course. INC, NMR, DNW count as zeros in the calculation of averages.

A student who receives an INC grade designation has up to eight months (two terms) to complete the appropriate course work. If, after eight months, the course work is not completed, then the INC is automatically converted to a DNW grade designation.

3.2 Posting of Final Grades by Instructors
Final course grades are not official until student examination reports have been issued by the Registrar’s Office. However, once the official final examination period is over each term, instructors in the Faculty of Mathematics are encouraged to post their lists of unofficial final grades, by I.D. number only, on their office doors. Faculty policy precludes such lists from including student names or being posted prior to the end of the official final examination period. Individual students who do not want their grades included on such posted lists must notify their instructors of this fact prior to the end of the official lecture period.

4. STUDENT APPEALS

4.1 Grade Appeal Procedure
Students should be aware that failing grades are automatically reviewed by course instructors to ensure that no errors have been made. It is also usual practice in multi-section courses to have examinations marked in common so that students in all sections are treated fairly.

Questions relating to a grade in a course offered by the Faculty of Mathematics are handled in three stages as specified below. Such questions should be raised as soon as possible. The deadline for initiating any appeal or reassessment is six months following the completion of a course.

1. Informal Discussion
   The first stage should be for the student to confer with the course instructor and to try to resolve any concerns as informally as possible. Such direct communications are usually the best way to resolve such issues. Advice may also be sought from the student’s Undergraduate Advisor.

2. Official Grade Appeal
   If questions concerning a grade cannot be resolved informally, the next stage is to request that the grade (including the final examination if appropriate) be formally reviewed by the course instructor. To request such an appeal, a Math Faculty Grade Appeal Form, obtainable from either the Registrar’s Office or the Mathematics Undergraduate Office, should be completed and submitted to the Registrar’s Office. Students wishing to personally review a copy of their final examination should indicate their intention on the Appeal form. Students are reminded that grades may either increase or decrease as the result of an appeal. The results of the appeal, including reasons, will be conveyed to the student by the Assistant Registrar, Mathematics.

3. Formal Reassessment
   If following an official grade appeal, students have reason to believe that they have been treated unfairly or have serious concerns about how their grade was achieved, then the next step is to consult with the Associate Dean for Undergraduate Studies. The Associate Dean will attempt to mediate in such situations.

   Should mediation fail to reach a resolution, then the student requests a formal reassessment of the work in question by an independent reviewer, as specified by the University Student Appeals Policy and Procedures. A review copy of this document is available from the office of the Associate Dean. To initiate a formal reassessment, students must complete an Application for Inquiry Form (Form A), available from the office of the Associate Dean. In lodging a formal reassessment request, students must have reviewed the final examination according to the procedure indicated in step 2, must indicate exactly what portion is being questioned and what redress is being requested, and must specify the reasons why they consider this action to be justified. Requests for a formal reassessment should be submitted to the office of the Associate Dean. In consultation with the original instructor and the student, the Associate Dean (for courses labelled MATH and MTHEL) or appropriate Department Chair (for courses offered by departments) will select an independent reviewer who shall report to the Associate Dean or Department Chair with a recommendation regarding the grade in the course. A final decision
will then be made by the Associate Dean or Department Chair, or that person’s delegate, as appropriate.

4.2 Faculty Committee on Student Appeals (FCSA)
The FCSA hears formal appeals of discipline case decisions for academic offences. For each case, a tribunal (consisting of two faculty members and one student member from the committee) is selected to hear the evidence and to reach a decision. Students with concerns are encouraged to discuss matters with the Associate Dean for Undergraduate Studies.

The membership of the FCSA consists of a chair, two members from each department in the Faculty of Mathematics, and four student members, one from each co-op stream, one from the regular program and one from graduate studies.

4.3 Policy and Procedure Documents
Complete copies of the official Student Academic Discipline Policy and Procedures or Student Academic Discipline Policy and Procedures documents may be obtained from the Associate Dean for Undergraduate Studies.

5. POLICIES RE: COURSES

5.1 Advanced/Honours/General Courses
A number of mathematics courses are offered at three different levels for BMath degree credit to accommodate the wide variety of students interested in such courses. The most challenging level, Advanced, is intended for exceptionally gifted students in an Honours program. The second level, Honours, is intended for all Honours students not taking the Advanced courses. The third level, General, is intended for students registered in the three-year General program. In some instances, there are also other versions of such courses designed for students in faculties other than Mathematics.

Advanced courses may always be substituted in lieu of corresponding Honours courses to satisfy Honours BMath degree requirements. Neither the Advanced nor Honours courses listed in Tables II and III, on pages 13:10 and 13:11, are open to students registered in the three-year BMath General program. However, in cases where a student registers in the General program following earlier registrations in an Honours program, any successfully completed Advanced or Honours courses may be substituted in lieu of the corresponding General required courses to satisfy three-year BMath General degree requirements. (See table with Note 2 on page 16:95 for a complete listing of such courses.)

5.2 Course Upgrading
A student who takes the General version of a course instead of the Honours version (e.g. MATH 227 instead of 237), but later wishes to pursue an Honours degree, may petition the Standings and Promotions Committee for special consideration. When the academic record of the student in question is of very high calibre, the Committee sometimes permits the student to count the General course toward an Honours degree in lieu of the Honours equivalent. The grade in the General course, however, is not normally included in the Graduating Averages which determine the student’s eligibility for an Honours degree.

5.3 Failed Courses
The minimum passing mark in all courses is 50%. If a student fails a course, he/she may either retake the same course (and this will be the case if the course is required for the degree being sought) or replace it by another course. The failed course remains a permanent part of the student’s record at the University, regardless of whether he/she passes the same course on a subsequent attempt, and it is included in course-attempt and failure counts. However, the failing grade will not be included in the Graduating Averages required for the degree in question (see Footnote 8 with Table I on page 13:8).

Note that supplemental examinations are not available for students in the Faculty of Mathematics.

5.4 Repeated Courses
A student may not normally retake a passed course more than once in an attempt to improve the grade. Both attempts will be included in the student’s quota of course attempts, but the course will be included only once in credit counts and may be counted at most once in the Graduating Averages required for the degree in question (see Footnote 8 with Table I on page 13:8).

5.5 No Credit/Overlap Courses
Some courses offered within the University may not normally be taken for credit toward a BMath degree. The content of such courses has usually been designed with the academic needs and background of students in faculties other than Mathematics in mind.

Other courses offered by various departments throughout the University sometimes deal with similar subject matter. In such instances, at most one entry from a group of ‘overlapping’ courses may count for credit toward a BMath degree.

Lists of such courses are published annually in the “How To Get Around in MATHEMATICAL CIRCLES” booklet, copies of which are available in the Mathematics Undergraduate Office (MC 5115). It is the student’s responsibility to be aware of the contents of these lists.

5.6 Correspondence Courses
The Correspondence Program at the University of Waterloo offers a large variety of courses each term primarily for part-time students who are not able to attend classes on campus. Concurrent registration by full-time BMath degree candidates in on-campus and Correspondence courses is not normally permitted.
For a BMath Honours degree, all explicitly specified course requirements must normally be satisfied by on-campus courses, and there are various on-campus full-time residency requirements to be met. Provided such residency requirements are met, however, any additional courses (math or non-math) may be taken on a part-time basis by Correspondence for Honours degree credit.

For a BMath General degree, students may elect to satisfy any course requirement by part-time Correspondence study, provided suitable courses are available in this mode.

A note of caution is in order for those students who will be studying full-time on campus in the Winter term and wish to take Correspondence courses in the preceding Fall term. Fall Correspondence courses do not begin until late October and normally have their final examinations near the end of January. This presents an overlap in course schedules between on-campus and Correspondence courses. Students are urged to consider carefully the potential extra workload involved in studying for, and writing exams in, Fall Correspondence courses while simultaneously carrying a full-time load of on-campus Winter courses.

Subject to the limitations described above, Correspondence courses may be taken on a part-time basis by Regular and Co-op students during terms off campus. Note that while on a work-term, Co-op students are limited to one half-credit course, unless they have written support from their employer to take two half-credit courses. Interested students are encouraged to discuss Correspondence course selections with their Faculty Advisor, but the actual paperwork to preregister for Correspondence courses involves a completely separate application form available in the Correspondence Program Calendar.

5.7 Courses at Other Universities  
(Letters of Permission)

Students in good academic standing (i.e. at least 60% cumulative all-inclusive overall average) are normally permitted to take non-math courses at other universities on a part-time basis during terms off campus, provided the courses are not explicitly required for their particular program. Such courses may be used as credits toward a Bachelor of Mathematics degree at Waterloo. However, only under very special circumstances will math students be permitted to take mathematics courses (i.e. MATH, CS, STAT, etc.) or required non-math courses, or study on a full-time basis, at other institutions to count toward their Waterloo degree requirements. Students wishing to take courses at other universities must apply to the Standings and Promotions Committee for permission by completing a special “Letter of Permission” form available from the Registrar’s Office. Please note that permission must be obtained before taking each course. The Committee will not normally approve courses taken elsewhere for Waterloo degree credit if prior approval has not been obtained.

All courses taken on a Letter of Permission will be recorded on Math Faculty Student Examination Reports with a grade of ‘CR’ (credit) or ‘NCR’ (no credit) as appropriate. As a result, the grades for such courses will be excluded from the calculation of averages used to determine eligibility for graduation with a BMath degree (see Footnote 8 with Table I on page 13:8). Note that, while on a work-term, Co-op students are limited to one half-credit course, unless they have written support from their employer to take two half-credit courses.

Care should be exercised in the selection of courses to be taken on a Letter of Permission to eliminate unnecessary duplication in course material covered and to ensure adequate preparation for subsequent courses the student is planning to take in future years at the University of Waterloo.

Once the Faculty has approved a request to take a course on a Letter of Permission, the student will be held responsible for it. It will be his/her responsibility to ensure that an official transcript from the host institution is sent to the UW Registrar’s Office within two months of the completion of the course. Otherwise, a grade of NCR (which counts as a failure) will be automatically submitted. Any changes a student wishes to make to an authorized Letter of Permission must be approved in advance by the Standings and Promotions Committee.

There is a non-refundable fee for processing each request for a Letter of Permission. (Only one host institution may be indicated on each request.) If replacement courses are requested because the host institution has cancelled or closed a course which has already been approved to be taken on a Letter of Permission, there will be no additional charge for this service.

5.8 Dropping/Adding Courses

Normally, the last day to ADD a course is two weeks after the official beginning of lectures.

A "standard" course load is five half-credits per term in all BMath degree programs. The last day to DROP a course for students not carrying more than a standard course load is four weeks after the beginning of lectures.

Students carrying more than a standard course load may not normally DROP any courses later than two weeks after the beginning of lectures.

These deadline dates apply only to Math Faculty students. All exceptions to these deadlines must be approved by the Standings and Promotions Committee.

Complete withdrawal from a Mathematics program without academic penalty is discussed in Section 6.7 on page 13:35.

Full-time Honours students considering taking less than a standard course load in a given term should first ensure that they are going to be able to satisfy the complete-term and basic-term registration requirements for an Honours degree (see page 13:6).
Since OSAP assistance is partially based upon the course load in which a student is enrolled, course drops during the term can affect a student's initial entitlement. Any students who wish to drop below three half-credit courses per term should first consult with the Student Awards Office staff in Needles Hall. In some cases, such action could have a significant effect on their OSAP entitlement.

A course attempt refers to a course registration not formally cancelled with the Registrar's Office. A course attempt not successfully completed constitutes a course failure.

6. MISCELLANEOUS POLICIES

6.1 Special Co-op Regulations

i) Co-op Degree Requirements
Co-operative mathematics students are expected to follow the normal alternating academic/work-term sequence appropriate to their program from admission through to graduation. For most students admitted at the 1A level, this sequence will normally involve eight academic terms and six work terms. (For students admitted beyond the 1A level, the normal numbers of academic and work terms will be adjusted accordingly.)

To be eligible for a Co-op degree, a student must normally have successfully completed all academic degree requirements, written at least four satisfactory work reports, followed an approved academic/work-term sequence and successfully completed at least five satisfactory work terms. (For students admitted beyond the Year One level, and for students in the Math/Teaching Option, Math/Chartered Accountancy, and Math/Chartered Accountancy/Computer Science Options, four satisfactory work terms may suffice depending upon individual circumstances.) Any work terms completed following a student's last academic registration will not be counted toward the minimum satisfactory work-term requirement for graduation.

Co-op mathematics students, who have not completed their Honours degree requirements at the termination of their approved academic/work-term sequence, will be eligible for a three-year BMath General (Regular) degree if they have satisfied the appropriate degree requirements. Being granted such a degree will not disqualify these students from being able to upgrade to an Honours degree. However, if they wish to obtain a Co-op degree, they will have to satisfy the appropriate Honours degree requirements within one further calendar year after the termination of their approved academic/work-term sequence. After one year, they will normally be eligible only for a Regular Honours degree.

ii) Re-arranging Academic/Work-term Sequences
Student requests to re-arrange academic/work-term sequences must be directed to the Standings and Promotions Committee on special forms available from the Registrar's Office, Co-operative Education and Career Services, and Mathematics Undergraduate Office.

Such requests will normally be approved if all of criteria 1-6 listed below are met. Students who alter their academic/work-term sequence, without first obtaining written approval from the Standings and Promotions Committee, may be required to withdraw from the Co-op program.

1. The request does not reduce the number of work terms remaining for the student at the time of the request.
2. The request does not involve more than two consecutive academic terms or two consecutive work terms.
3. There is no obvious indication that the new sequence requested will result in serious course selection difficulties for the student.
4. The student's academic performance to date is of sufficiently high calibre that he/she should not suffer academically from being off campus for any eight-month work terms which might be involved in the request.
5. The student's employer supports the request in writing (if appropriate).
6. The request is properly documented.

Before making a formal request to the Standings and Promotions Committee to rearrange an academic/work-term sequence, it is often advantageous for the student to discuss the situation with a Co-ordinator and Faculty Advisor. If the request is approved by the Standings and Promotions Committee, it is the student's responsibility to deal with any timetabling difficulties which may arise and to make any necessary preregistration arrangements for subsequent terms.

iii) Course Load During Academic Terms
While registered for an academic term, Co-op students are normally expected to maintain a full-time course load of four or more half-credits, unless they have already satisfied the complete-term and basic-term registration requirements for an Honours degree and are within one or two half-credits of fulfilling the academic degree requirements for their program. (See the section "Satisfying Basic And Complete-Term Registration Requirements For A BMATH Honours Degree" on page 13.6). While on a work term, Co-op students are limited to one half-credit course, unless they have written support from their employer to take two half-credit courses.

6.2 Course Load
Students may not normally preregister for more than a standard course load of five half-credits per term. In exceptional circumstances, Honours students with strong academic records may be permitted to add further courses during the course-change period at the beginning of term, subject to the approval of their Faculty Advisor. General students may not normally
add courses beyond a standard course load of five half-credits per term. When seeking approval to take additional courses beyond a standard course load, students should ensure that they have their most recent mark report for consultation with their Faculty Advisor. Any students carrying more than a standard course load of five half credits at the end of the two-week course-change period may not normally drop any courses after that date.

### 6.3 Year Classification

For official registration purposes, a student’s “year” will normally be determined by the number of half-credits (N) achieved to date:

<table>
<thead>
<tr>
<th>Year</th>
<th>0 ≤ N &lt; 10</th>
<th>10 ≤ N &lt; 20</th>
<th>20 ≤ N &lt; 30</th>
<th>30 ≤ N</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Year</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Second Year</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Third Year</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fourth Year</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 6.4 Registration of Regular Students in Spring Terms

Students in the Regular program normally take courses during the Fall and Winter terms. They may also register, on a part-time or full-time basis during the Spring (May-August) or Summer (July-August) term. However, there are no Math Faculty course offerings in the Summer term and those in the Spring term are planned primarily for Co-op students. Because of resource limitations, it may not always be possible to allow Regular students universal access to Math Faculty course offerings in the Spring term. First priority for access to particular courses in the Spring term will always be given to Co-op students.

Co-op students normally preregister for Spring courses at the beginning of the preceding November. Regular students may preregister in early February. By that time, the extent of the demand by Co-op students for Spring courses will be known and departments will be in a better position to determine which courses will be available to Regular students. (A list of courses closed to Regular students will be available for February preregistration.) If subsequent preregistration requests from Regular students should exceed the space available in the non-restricted courses, it may not be possible to accommodate all Regular students in the courses in question, and preference will normally be given to students who preregister during the February preregistration period.

### 6.5 Course Prerequisites

At any time prior to the completion of lectures, if it is discovered that a student is taking a course offered by the Faculty of Mathematics without having previously successfully completed all the course prerequisites stated in the University Undergraduate Calendar, the student is subject to having his/her preregistration/registration in that course purged from university records. Such purging may be done at the request of the course instructor, the department offering the course, and/or the Faculty of Mathematics, but not without the consent of the instructor.

### 6.6 Illness or Incapacity

Normally, failure to write a required final examination or complete required work in any course in which a student is officially registered, or failure to complete such a course for some other reason, will result in a DNW, NMR or INC grade being recorded for the course. All of these grades are considered as failures for the purpose of course-attempt and failure counts and count as zeros in average calculations.

Illness may constitute an acceptable reason for not writing an examination. Students who miss examinations because of illness should provide a medical certificate to the Mathematics Undergraduate Office (MC 5115) documenting the precise period of absence and the nature of the illness. Students will be assigned a grade of INC for the affected courses and must contact the professors involved to determine how the courses are to be completed. Where circumstances warrant special consideration, instructors may submit an AEG grade, assign a passing mark based solely on term work, or arrange for a deferred examination.

A student who becomes ill during the writing of an examination and is unable to continue should ensure, before leaving the site of the examination, that the officer in charge is notified of the situation. In addition, the student should notify the course instructor and supply proper medical documentation as soon as possible thereafter.

If a student completes an examination, even though he/she is ill, the subsequent grade obtained in the course must normally stand. Subsequent appeals on the grounds of illness may be considered if accompanied by proper medical documentation and should be submitted as soon as possible after the examination to the course instructor or to the Registrar's Office. The Standings and Promotions Committee may take the illness into consideration, and possibly alter academic decisions regarding eligibility to continue in the student’s program of study, but the mark may not normally be altered on the student’s official university record.

### 6.7 Voluntary Withdrawal

The normal deadline date for Math undergraduate students to withdraw from all their courses, without academic penalty, is four weeks after the beginning of lectures in a given term. However, exceptions will normally be made for 1A students who have never previously been registered at a degree granting post-secondary institution. Such students will normally be permitted to withdraw from all their courses without academic penalty as late as the last official day of lectures for their 1A term. (A special 'Withdrawal Form', available from the Registrar's Office, must be completed.) A student who withdraws late will normally be held responsible for that term’s courses in the
sense that such courses will be permanently recorded with grades of DNW and will subsequently be counted as course attempts and failures. Students in this category may still be eligible for tuition and residence fee rebates, depending of course, upon the date of withdrawal.

A student who has been admitted as a BMath degree candidate and subsequently withdraws without academic penalty prior to completing at least one term of study must request re-admission in order to register for a subsequent term. Such requests will be considered by the Faculty Admissions Committee in competition with other new applicants for admission at that time. (Note: the Faculty of Mathematics does not normally offer admission for the Winter or Spring terms.)

6.8 ‘Inactive’ Status/Re-Admission
A BMath degree candidate who has been ‘inactive’ for more than four consecutive academic terms must apply for re-admission by writing to the Assistant Registrar, Faculty of Mathematics, in Needles Hall. A resume covering the ‘inactive’ period, including official transcripts from any post-secondary institutions attended, must accompany the letter requesting re-admission. If the student is re-admitted, Faculty policies in effect at the time of re-admission will apply, unless stated otherwise by the Faculty when re-admission is approved.

(‘Inactive’ is taken to mean that the student has not been registered as a BMath degree candidate at the University of Waterloo, or on an approved Letter of Permission.)

7. BMath Writing Skills Requirement
BMath degree candidates must satisfy the following Writing Skills Requirement:

“A grade of 80% or better in English OAC1 or a grade of 60% or better on the UW English Language Proficiency Exam or a half-credit with a mark of C- or better in a term-course chosen from a list approved by the Undergraduate Affairs Committee and maintained by the Math Undergraduate Office. (The current list includes the following English courses: ENGL 109, 129R, 150, 210A and 210C.)” The entry ARTS 000 will appear on subsequent Student Examination Reports with a CR grade once the student has successfully completed the Writing Skills Requirement.

8. “Areas of Study” on Transcripts
BMath transcripts include explicit mention of no more than two areas of study in the academic program section.
Undergraduate Chemistry students prepare for a training course in WHMIS (Workplace Hazardous Materials Information System).
Faculty of Science

The Faculty of Science consists of four departments Biology, Chemistry, Earth Sciences and Physics, and the School of Optometry.

Since the first students were enrolled in Fall, 1959, the Faculty has grown to 2200 undergraduates and 260 graduate students pursuing full-time studies, and another 1500 undergraduate and graduate students in part-time studies.

Degrees
The degree of Bachelor of Science (BSc) is awarded on the successful completion of the three-year General and four-year Honours programs. The degree Doctor of Optometry (OD) is awarded on the successful completion of a four-year professional program.

Programs
Biochemistry, Biology, Chemistry, Earth Sciences and Physics programs are available on both the Regular and Co-operative system of study. In the Co-operative system the students alternate four-month study terms on campus with four-month work terms in industry, business or government, in an area related to their studies.

The Faculty of Science also offers Honours Science and Business (Co-op or Regular), Honours Liberal Science (Science for the Generalist) and Environmental Science programs, and four-year Honours and three-year General non-specialized programs. In addition, an Honours BSc in Psychology is offered in co-ordination with the Department of Psychology. A small number of students may be accepted into the BSc Psychology program in Co-operative study.

Graduate programs leading to the degrees of MSc and PhD are discussed in the University of Waterloo Graduate Studies calendar.

Admission

The admission categories, requirements and procedures for all programs are outlined in Chapter 2 of this Calendar.

Normally, admission to the Faculty of Science is to one of the Co-operative programs in Biology, Biochemistry, Chemistry, Earth Sciences or Physics, or to Regular Honours Science. In Regular Honours Science a major field of study or the Non-major program (Honours Science – Program One) must be selected on pre-registration.

Transfer Students
Students may be accepted for transfer from other programs in the University or from other universities. Their programs will be evaluated in terms of the number of credits allowed and the number remaining for a degree. Normally transfer students will be required to complete a minimum of 50% of the course work while registered in the Faculty of Science.

Credits will be transferred without a cumulative average and only for relevant courses with a 60% or better mark. Students applying to transfer to Co-operative programs in the Faculty of Science will not normally be admitted above the Year Two Term B level.

Admission as a Mature Student
Applicants are normally required to obtain standing in OAC Calculus and one OAC Science (Chemistry or Physics preferred) or their equivalent in order to have the proper background for first year University courses in these areas. To discuss admissibility, applicants are advised to contact the Assistant Registrar, Faculty of Science.

English Language Proficiency Requirement
All Faculty of Science students entering degree programs in September, 1982 or later must write the English Language Proficiency Examination (scheduled during registration week), with the exception of entrants with 80% or better in OAC English 1. These students will not be required to write the ELPE examination.

They must achieve a passing grade of 50% or successfully complete the writing assignments of the University of Waterloo Writing Clinic in order to fulfill degree requirements.

WHMIS (Workplace Hazardous Materials Information System)
All students who have registered for any Faculty of Science course with a laboratory component, will need proof that they have attended a WHMIS session in order to enter the laboratory.

Program and Course Selection

First-Year Programs (Regular and Co-operative)
The normal minimum course load for a full-time student in Year One Science is five lecture courses plus required labs per term. At least two of these must be lecture credits from the Year One offerings in two different disciplines from the Faculty of Science.

Students are encouraged to select an Arts elective (preferably English or Psychology). Students whose secondary school OAC average was 70% or better may select six lecture-courses if they wish. It is recommended that students intending to take an Honours Physics program enrol in six lecture-courses.

Courses should be chosen either with a specific Year Two goal in mind or to cover many Year Two programs. The required and recommended Year One selections for Year Two Honours programs and Optometry can be found in the table on page 14:7.
Course and Program Changes

1. Students may "add or drop" courses during the first two weeks of the Fall, Winter and Spring terms upon having the appropriate change form completed.

2. Courses may be dropped after the normal two weeks change period with adequate cause but not after November 1, March 1 or July 1 for Fall, Winter and Spring courses. The permission of the instructor and the appropriate Undergraduate Officer or the Associate Dean must be obtained. Courses which have not been dropped officially will receive a DNW grade.

3. Students may not drop a laboratory course without written clearance from the lab supervisor (faculty member or senior demonstrator). Students not checking out of such courses remain liable for the full value of the locker kit issued to them.

4. Students may withdraw from the University as late as the official course drop date without penalty on their record. If however, a student chooses to withdraw to avoid a number of failures, he or she will likely be disqualified for readmission.

Eligibility for Courses

Students must ensure they have the appropriate course prerequisites and where applicable corequisites stated in the course descriptions in the calendar.

Overlap Courses

Where substantial overlap exists between two courses credit will be granted for only one even if they are not listed as antirequisites.

Since some Science departments offer both Honours and General equivalent courses it is the student's responsibility not to duplicate subject matter. Credit will only be given for one of such overlapping courses (e.g. CHEM 266 or 264; PHYS 111, 112 or 121, 122).

This rule also applies to courses offered by various departments throughout the University which sometimes deal with similar subject matter (e.g. STAT 204 or PSYCH 200).

Correspondence Courses

Only in exceptional cases should correspondence courses be taken by students in a term in which they are full-time students. Regular and Co-op students during their terms off-campus may take Correspondence courses on a part-time basis. Only in exceptional cases can Honours students take a core-course by Correspondence and they cannot take a Correspondence course in order to reduce course-load in a term in which they are a full-time student.

Letters of Permission

Students in good academic standing and whose total number of transfer credits is less than the maximum permitted may be allowed to take an elective course at another university during a term off-campus to count as credit towards their degree.

A student wishing to do so must complete the Letter of Permission form available at the Registrar's Office (for a fee) and have it authorized by the Associate Dean or an appropriate Undergraduate Officer. The letter of permission must be obtained before taking the course.

A course taken on a letter of permission will be given credit with no grade assigned as long as the mark obtained is 60% or better.

Audit

The Faculty of Science does not record nor recognize audits for students in Science or any other Faculty.

Enrolment in a Graduate Course

A student may obtain credit toward a graduate degree in the Faculty of Science for normally not more than one term graduate course taken during the fourth year of an undergraduate program provided this course is not used for credit toward his/her undergraduate degree. Prior approval of the Faculty Graduate Studies Committee must be obtained for students wishing to do so.

Credit for the graduate course toward a graduate degree will not be given unless the student attains an A average in his/her major subjects in the fourth year.

Reduced Program

The General Science degree may be taken on a completely part-time or reduced program basis. The Honours Science - Program One degree may be taken on a part-time or reduced program basis if permission is granted by the Examinations and Standings Committee. Normally all other Faculty of Science degrees must be completed (fourth-year) in full-time study, and either the second or third year must also be carried out in full-time study. In order to be considered in full-time study, a student must be taking a minimum of five credits in one academic year.

A student in good standing who "stops out" of any Program for more than a year must have departmental approval before returning to that program.

Only in exceptional circumstances may a first-year program for a full-time student be reduced below the five lecture-course minimum.

Upgrading of BSc Degree

Normally a student may not upgrade a General BSc or its equivalent to a Waterloo Honours BSc. However, from time to time such conversion privileges may be allowed in exceptional cases on the recommendation of the department(s) concerned and with the approval of the Examinations and Standings Committee.

Rulings of the Committee in any particular case on the conditions to be met for such conversion may include time limits.
Teacher Certification in Ontario
The Ontario Teacher's Certificate may be granted by the Ministry of Education after the successful completion of a program taken at an approved Ontario Faculty of Education. The Faculties of Education require that applicants hold an acceptable University degree (BA or BSc or equivalent, three- or four-year General or Honours).

Those students interested in seeking admission to a Faculty of Education should contact the appropriate university.

Future Regulations
Normally, students will be given advanced warning of changes in regulations but the Faculty reserves the right to make changes without notice where necessary.

Examinations and Standings
The following regulations govern the practice of the Faculty of Science in regard to final examinations, standing and make-up examinations. These regulations also apply to part-time students and special programs. Further details concerning University Examination Regulations can be found in Chapter 1.

Students should note that the Faculty of Science normally operates under a "credit-weight system" in which student progress is measured by credits successfully completed rather than by years. (The only exceptions to this are Honours Earth Sciences programs. These programs follow the term course system.) Students who have passed fewer than five credits successfully will be considered Year One students; those with at least five but fewer than ten, Year Two; those with at least ten but fewer than 15, Year Three; and those with 15 or more, Year Four.

Final Examinations
1. The Faculty constitutes the examining body for all examinations. All examination results are considered by the Examinations and Standings Committee and subsequently by the Faculty Council. After the results have been considered by these bodies, they will be issued to individual programs. Further details concerning University Examination Regulations can be found in Chapter 1.

2. Final examinations are held in December, April, or August. The time normally allowed for each examination is three hours.

3. In all courses each student is required to submit, in such form and at such time as may be determined by the instructor, evidence of satisfactory participation in term work. The marks obtained for work during term are used, in part, in determining standing. The ratio in which marks for term work and written examinations are combined is at the discretion of the individual departments. To pass a course, a student must obtain a minimum of 50% in the combined term and examination marks. Some courses and/or instructors may not require final examinations; in such cases term work only will be used in determining a final grade.

4. Failure to write an examination is considered a failure to pass. A student who defaults a final examination, except for a properly certified reason, shall have no make-up examination privileges and must repeat the work in class. If a student fails to write for health reasons, a Doctor's certificate, covering the precise period of absence, must be filed in the Registrar's Office within one week after the examination should have been written.

5. In cases where a course (failed or passed) is repeated, both marks will be used in calculating the student's cumulative averages. If a passing grade is achieved more than once in the same course, it will still only count as one course passed towards the total necessary for graduation. Students in good standing will not normally repeat courses they have passed.

6. No course or its equivalent may be repeated more than once.

7. All examinations which receive a failing grade are automatically re-read.

8. Make-up examination privileges may be granted to students in good standing where failure to pass is attributable to extraordinary circumstances, especially medical or health-related problems. The student must have satisfied all term-work requirements in the course and have the permission of the Examinations and Standings Committee.

Co-operative Program Evaluation
Students in Co-operative programs will be evaluated by the rules shown, modified where necessary to suit their special needs. In particular:

1. Evaluation in Year One will be made at the end of term 1B on the entire year’s work. Students not meeting requirements of their program will be transferred to another Science program (Regular system) in good standing, if possible.

2. Assessment will be made on a term-by-term basis during Years Two and Three. Terms 4A and 4B will normally be assessed as a unit at the end of the 4B term when both terms are taken consecutively from September to April. Normally a student may take no more than two upper year terms on a part-time or reduced program basis and must have special permission from the Department to do so.

3. A student is expected to follow the work-term sequence from the point of entry, subject to the minimum requirements for graduation within the individual programs.
The minimum number of related work-terms required is normally four.

The minimum number of satisfactory work reports is normally four.

Standing

Grades
Marks in individual courses will be reported as numerical marks on the scale 0 to 100. A mark of 50 or better is necessary to pass and receive credit for a course. For Science students, any grade of less than 32 will be used, equivalent to the weighting factor for the F- on the common system.

Conditional Standing
A student who marginally fails to meet the required standards of any program will be placed on conditional standing for one term only. During this period the student must regain standing in that program or withdraw from it. Conditional standing will be granted only once in any particular program.

Required to Withdraw
A student will normally be required to withdraw from the Faculty of Science after failing more than 2.0 credits in any academic year (or equivalent), or after failing to achieve an overall cumulative average of at least 55% and a cumulative average of 55% in all Science courses, or if unlikely to profit from further study, in the opinion of the Examination and Standings Committee.

Students who have been "required to withdraw" from the Faculty of Science may not apply for readmission for at least two academic terms.

After two terms have elapsed, a formal application may be submitted to the Registrar’s Office. Applicants must include a typewritten statement along with their application outlining why they are now likely to succeed, and a supporting letter from, for example, an employer or minister of religion.

Readmission is not automatic. All such applicants will be assessed in competition with new applicants and on the probability of their future success.

Readmission when granted will be with conditional standing.

Terminology
INC (either term work, lab work, examination, etc., are incomplete). A course for which the grade designation INC has been given must be completed within two terms of taking the course or the INC automatically becomes a mark of 32. If a graduating student has an INC, it will be recorded as 32 on the transcript. Students should not re-register in an INC course. They should see the instructor to arrange completion of the course.

AEG (aegrotat) - signifies the student’s work or examination was incomplete because of illness and the instructor is satisfied that the student should receive credit for the course but a numerical mark could not be set.

CR - Credit granted where performance was satisfactory but no specific mark is given and AEG is not appropriate.

NCR - Credit is not granted where performance was unsatisfactory but no specific mark is given.

DNW - Final examination not written in a course that has not been dropped officially whether the course has been attended or not. Unless a DNW grade is replaced by an INC or AEG grade for medical or extenuating circumstances it will be weighted for averaging purposes as a mark of 32 (equivalent to F- on the common grading system) in determining standing.

AEG or CR will count as a course passed towards the total necessary but will not count in the cumulative averages.

"Attempt" is a course completed, whether passed or failed, or recorded as INC or DNW. Courses dropped before the official deadline are not considered as attempts and do not appear on the transcript.

Overall standing will be determined at the end of a term or a year by the cumulative average of all courses taken while in the Faculty of Science at any time (whether passed or failed).

Course
A course may refer to a lecture course, a laboratory course, or a lecture-laboratory course which includes both lecture and laboratory.

Most laboratory courses are designated by the letter L following the course number.

Participation courses in Dance, Fine Arts, Drama and Music are considered to be laboratory courses.

Credit
Credit values are assigned for lecture and laboratory courses as designated in the course descriptions (also see chapter 16).

Dean’s Honours List
The Faculty of Science has a Dean’s Honours List to recognize outstanding academic achievement.

To be eligible students must have completed a term of an Honours Program with a cumulative average and an overall average for the completed term of at least 80%, have carried a full course load, and not have an INC, DNW or failed course.

The award will be noted on the student’s transcript, and the student will receive a congratulatory letter and certificate from the Dean.
Appeals, Petitions and Re-Assessment

An appeal may be initiated by a student who believes that an error in academic judgement or procedure has occurred. Belief that an examination included material outside the proper content of the course, or that the instructor refused to accept receipt of legitimate medical evidence are examples of grounds for appeal.

A petition is appropriate if a student seeks relief from normal University or Faculty rules and regulations for reasons beyond his or her control, e.g. illness or bereavement prevented completion of a course.

A re-assessment of an examination may be requested by a student who is convinced that the mark assessed is unreasonable.

Whenever possible, an informal approach to the person whose judgement is being questioned should precede a formal appeal or request for a re-assessment. Properly documented reasons must be provided for all petitions, formal appeals or requests for a re-assessment. Mere dislike of a low mark is not a sufficient reason to request a re-assessment.

Please refer to page 1:10 for more details.

Alumni Gold Medalist

An Alumni Gold Medal is presented annually (usually at Spring Convocation) to a student who has demonstrated outstanding academic performance on completion of an undergraduate program.

YEAR ONE SCIENCE PROGRAM SELECTIONS

<table>
<thead>
<tr>
<th>Major Field of Study</th>
<th>Required Courses in Year One</th>
<th>Recommended Electives in Year One</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology</td>
<td>Two 200-level term courses in Biology, CHEM 120/123 and 120L/123L, CS 102.</td>
<td>PHYS 111/112, or MATH 113A/B</td>
</tr>
<tr>
<td>Biochemistry (see Note 3)</td>
<td>BIOL 230, 239, MATH 113A/B, CHEM 121/125 and 120L/123L, 129, PHYS 111/111L or 121/121L, and 112/112L.</td>
<td>EARTH 121/122 and 121L/122L, a third 200-level term course in Biology.</td>
</tr>
<tr>
<td>Biology and Chemistry</td>
<td>Two 200-level term courses in Biology; MATH 113A/113B, CHEM 121/125, 120L/123L, 129, PHYS 121/121L, or 111/111L</td>
<td></td>
</tr>
<tr>
<td>Biology/Business Economics (see Note 3)</td>
<td>Four 200-level term courses in Biology, CHEM 120/123 and 120L/123L, FCON 101/102, ACC 123, CS102.</td>
<td></td>
</tr>
<tr>
<td>Biology and Environment and Resource Studies (see Note 3)</td>
<td>Two 200-level term courses in Biology, two term courses in Environment and Resource Studies, CHEM 120/123 and 120L/123L, CS 102.</td>
<td></td>
</tr>
<tr>
<td>Biology and Geography (see Note 3)</td>
<td>Two 200-level courses in Biology, two term courses in Geography, CHEM 120/123 and 120L/123L, CS 102.</td>
<td></td>
</tr>
<tr>
<td>Chemistry</td>
<td>CHEM 121/125, 120L/123L, 129, MATH 113A/B, PHYS 121/112 and 121L/112L.</td>
<td></td>
</tr>
<tr>
<td>Chemistry and Environment and Resource Studies</td>
<td>CHEM 121/125, 120L/123L, 129, ERS 100, 101, 150, two 200-level courses in Biology, MATH 115A/B, ENV S 195.</td>
<td></td>
</tr>
<tr>
<td>Chemistry with Options</td>
<td>CHEM 121/125, 120L/123L, 129, MATH 113A/B, PHYS 121/112 and 121L/112L.</td>
<td>BiOL 111/112, or two 200-level term courses in Biology, EARTH 121/122 and 121L/122L, ENV S 195.</td>
</tr>
<tr>
<td>a) Chemistry (Environmental Studies Option)</td>
<td>CHEM 121/125, 120L/123L, 129, MATH 113A/B, PHYS 121/112 and 121L/112L, MATH 114 or 136, CS 102.</td>
<td></td>
</tr>
<tr>
<td>b) Chemistry (Mathematics Option)</td>
<td>CHEM 121/125 and 120L/123L, 129, MATH 115A/B, PHYS 121/112, and 121L/112L, MATH 114 or 136, CS 102.</td>
<td></td>
</tr>
<tr>
<td>Chemical Physics</td>
<td>CHEM 121/125, 120L/123L, 129; PHYS 121/122, 121L/122L, 123, MATH 115A/0, 136</td>
<td>ENGL 109, 140, PHIL 215</td>
</tr>
</tbody>
</table>
### YEAR ONE SCIENCE PROGRAM SELECTIONS

#### Regular Programs

<table>
<thead>
<tr>
<th>Major Field of Study</th>
<th>Required Courses in Year One</th>
<th>Recommended Electives in Year One</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earth Sciences</td>
<td>EARTH 121/122 and 121L/122L, CHEM 120/123 and 120L/123L, PHYS 121/122 and 121L/122L, CS 102, MATH 113A/B, one unrestricted term course.</td>
<td></td>
</tr>
<tr>
<td>Earth Sciences with Options</td>
<td>EARTH 121/122, and 121L/122L; CHEM 120/123 and 120L/123L; PHYS 121/122 and 121L/122L, CS 102; MATH 113A/B; ECON 101 or 102.</td>
<td></td>
</tr>
<tr>
<td>a) Earth Sciences (Economics Option)</td>
<td>EARTH 121/122, and 121L/122L; CHEM 120/123 and 120L/123L; PHYS 121/122 and 121L/122L, CS 102; MATH 113A/B; ECON 101 or 102.</td>
<td></td>
</tr>
<tr>
<td>b) Earth Sciences (Geography Option)</td>
<td>EARTH 121/122 and 121L/122L, CHEM 120/123 and 120L/123L, GEOG 101/102, CS 102. Either PHYS 111/112 and 111L/112L or BIOL 111/112 or equivalent elective.</td>
<td></td>
</tr>
<tr>
<td>Environmental Science Program 1 (Basic Program) (Note 3)</td>
<td>BIOL 240/250, CHEM 120/123, 120L/123L, MATH 113A/B or 115A/B, ENV S 195, EARTH 126</td>
<td>CS 102, GEOG 102, STAT 202, BIOL 241, 273</td>
</tr>
<tr>
<td>Environmental Science Program 1 (Ecology/Environmental Impact Assessment Theme) (Note 3)</td>
<td>same as for Basic Program</td>
<td>CS 102, STAT 202, BIOL 241, 273</td>
</tr>
<tr>
<td>Environmental Science Program 1 (Environmental Analysis Theme) (Note 3)</td>
<td>same as for Basic Program plus BIOL 230</td>
<td>ACC 121 or equiv., CHEM 266, ECON 101, STAT 202</td>
</tr>
<tr>
<td>Environmental Science Program 1 (Water Resources Theme) (Note 3)</td>
<td>same as for Basic Program</td>
<td>CS 102, CIV E 221, GEOG 275, STAT 202, BIOL 241, 273</td>
</tr>
<tr>
<td>Environmental Science Program 2 (Notes 3 and 5)</td>
<td>BIOL 240, 250, CHEM 120/123, 120L/123L, PHYS 121/122, 121L/122L, MATH 115A/B, ENV S 195, EARTH 126</td>
<td></td>
</tr>
<tr>
<td>Optometry (consult page 14:38 for full list of prerequisites for admission to Optometry).</td>
<td>BIOL 230 and 211, CHEM 120/123 and 120L/123L, PHYS 121/122 and 121L/122L, MATH 113A/B, PSYCH 101.</td>
<td>PSYCH 102(A-K) or SOC 101.</td>
</tr>
<tr>
<td>Physics (see Note 1)</td>
<td>PHYS 121/122 and PHYS 121L/122L, PHYS 123, MATH 115A/B or MATH 113A/B, MATH 111A/B</td>
<td>CHEM 120/123 and 120L/123L.</td>
</tr>
<tr>
<td>Psychology</td>
<td>Two 200-level term courses in Biology, CHEM 120/123 and 120L/123L, PHYS 111/112, 111L/112L or 121/122 and 121L/122L, MATH 113A/B, PSYCH 101, one Psychology elective.</td>
<td></td>
</tr>
<tr>
<td>Honours Science and Business (see Notes 3 and 4)</td>
<td>2.0 Science lecture-credits from the Year One offerings in Chemistry, Earth Sciences, Physics or two 200-level term courses in Biology, MATH 113A/B, BUS 111W, BUS 121W, CS 102.</td>
<td>MAT111B.</td>
</tr>
<tr>
<td>General Science, Honours Science non-major, Liberal Science (see Note 3)</td>
<td>2.0 Science lecture-credits from the courses offered to Year One students in Biology, Chemistry, Earth Sciences &amp; Physics. One Liberal Science Core Course for Liberal Science (Science for the Generalist) program.</td>
<td>MATH 113A/B, CS 102.</td>
</tr>
</tbody>
</table>
## YEAR ONE SCIENCE PROGRAM SELECTIONS

### Co-operative Programs

<table>
<thead>
<tr>
<th>Major Field of Study</th>
<th>Required Courses in Year One</th>
<th>Recommended Electives in Year One</th>
</tr>
</thead>
<tbody>
<tr>
<td>Co-operative Biology (see Notes 2 and 3)</td>
<td>Three or four 200-level term courses in Biology, CHEM 120/123 and 120L/123L, CS 102.</td>
<td>PHYS 111/112, EARTH 121/122 and 121L/122L.</td>
</tr>
<tr>
<td>Co-operative Biology/Business Economics</td>
<td>same as Biology/Business Economics – Regular</td>
<td></td>
</tr>
<tr>
<td>Co-operative Biochemistry (see Note 2)</td>
<td>BIOL 230, 239 and either two 200-level term courses in Biology (in Stream 4) or one 200-level term course in Biology plus one free elective (in Stream 8); CHEM 121/125, 120L/123L, 129, MATH 115A/B, PHYS 121/121L or 111/111L.</td>
<td></td>
</tr>
<tr>
<td>Co-operative Biochemistry (Biotechnology Option) (see Note 2)</td>
<td>same as Co-op Biochemistry above</td>
<td></td>
</tr>
<tr>
<td>Co-operative Biology and Chemistry (see Note 2)</td>
<td>Three 200-level term courses in Biology, CHEM 121/125, 129, 120L/123L, MATH 115A/B, PHYS 121/121L or 111/111L.</td>
<td></td>
</tr>
<tr>
<td>Applied Chemistry (see Note 2)</td>
<td>CHEM 121/125, 120L/123L, 129, MATH 115A/B, PHYS 121/112 and 121L/112L.</td>
<td></td>
</tr>
<tr>
<td>Applied Earth Sciences (Environmental Hydrogeology Option) (see Note 3)</td>
<td>EARTH 123/126, CHEM 120/123 and 120L/123L, PHYS 121/122 and 121L/122L, MATH 115A/B, CS 102.</td>
<td></td>
</tr>
<tr>
<td>Applied Earth Sciences (Geology Option) (see Note 3)</td>
<td>EARTH 121/122, and 121L/122L, CHEM 120/123 and 120L/123L, PHYS 121/122 and 121L/122L, MATH 113A/B, CS 102.</td>
<td></td>
</tr>
<tr>
<td>Applied Earth Sciences (Geophysics Option) (see Note 3)</td>
<td>EARTH 121/122, and 121L/122L, MATH 115A/B; PHYS 121/122 and 121L/122L, CHEM 120/123 and 120L/123L, CS 102, MATH 114 or 111B.</td>
<td></td>
</tr>
<tr>
<td>Applied Physics (see Notes 1 and 2)</td>
<td>PHYS 121/122 and PHYS 121L/122L, MATH 115/115A/B, PHYS 123.</td>
<td>CHEM 120/123 and 120L/123L.</td>
</tr>
<tr>
<td>Applied Physics (Geophysics Option) (see Notes 1, 2 and 3)</td>
<td>PHYS 121/122 and 121L/122L, PHYS 123, MATH 111B or 136, 115A/B, CHEM 120/123 and 120L/123L, EARTH 121/122 and 121L/122L.</td>
<td></td>
</tr>
</tbody>
</table>

### Notes

**Note 1**
Co-op Physics students and those planning to enrol in Honours Physics in Year Two may select MATH 137/138 instead of MATH 113A/B or 115A/B and MATH 135/136 instead of MATH 111A/B, if they have more than an 80% average in OAC Mathematics and Physics.

- Students wishing a Biophysics Option with the Honours Physics program are advised to include BIOL 111/112 in their program.
- Students wishing a Geophysics Option with the Honours Physics program are advised to include EARTH 121/122 and CHEM 120/123 in Year One.
- Students wishing any of the Business Administration Options with the Honours Physics program are advised to select ECON 101/102.

**Note 2**
Students in the Co-operative Biology, Biochemistry, Chemistry, and Physics programs have two methods of taking Year One: (a) two terms in a row “8-stream” (September-December), Winter term at work (January-April) and Spring term on campus (May-August).

**Note 3**
CS 100 must be taken before CS 102 by students with no computing background from high school.

**Note 4**
Students needing CS 100 in the Fall must delay CS 102 to the Winter (1R) and reschedule their MATH 111R in Year Two and MATH 100 to 2A.

**Note 5**
Physics: Students whose major interest is Physics may select MATH 137/138 instead of MATH 115A/B if they have more than an 80% average in OAC Mathematics and Physics.
General Programs

THREE-YEAR GENERAL PROGRAM
The three-year General program allows students to specialize to a limited extent in a particular subject area or to pursue a broad range of Science subjects. However, students graduate with the "General Science" degree with no area of specialization designated.

Students who have completed Year Two or Three of the three-year program with credit in the required courses are qualified to apply for admission to medical school in Ontario. Students who have passed the first year of the program with appropriate choice of courses are qualified to apply for admission to a dental school.

Students must maintain an overall cumulative average of 55% and a cumulative average of 55% in all Science courses to be able to continue in Years Two and Three of the General Science program.

In order to graduate with a three-year General degree, the following requirements must be met:
1. Successful completion of 15.0 credits with a cumulative overall average of 55% and 55% in all Science courses. Of the 15.0 credits:
   a) 14.0 must be lecture credits;
   b) at least 7.5 must be Science credits, and 2.0 of these must be lecture credits from the Year One offerings in two different disciplines;
   c) at least 7.5 must be at or above the 200-level;
   d) at least 1.0 credit must be in MATH.
2. No more than 3.0 SCI credits may be applied to the three-year General degree.
3. No more than 5.0 failed credits will be allowed.
4. A minimum of 3.0 lecture credits must be obtained per academic year, with no more than 2.0 failed credits allowed.

In addition, normally no more than 7.0 credits can be from any one department (for example, 7.0 Biology credits, or 7.0 English credits). Students are encouraged to take at least 2.0 credits from non-science areas, such as Arts or Mathematics.

Normally, 5.0 lecture credits per year are taken.

Year One
5.0 lecture credits, exclusive of laboratory credits. At least two of (a), (b), (c) or (d) must be taken:
   a) BIOL 111/112, or two 200-level term Biology courses;
   b) EARTH 121/122 + labs;
   c) CHEM 120/123 + labs;
   d) PHYS 111/112 or PHYS 121/122 + labs.
It is recommended that the required MATH credit be taken in Year One.

Honours Programs

The Faculty of Science offers two different types of Honours degrees – the Honours Science programs, and the Honours Major programs.

Minors with Honours Programs
A Minor in each of the four disciplines, Biology, Chemistry, Earth Sciences and Physics is available to Honours students in another department. See individual departmental sections for further information about the requirements.

Teaching Option with Queen's University
In the Co-operative Biology, Biochemistry, Chemistry and Physics programs it is now possible to replace one work-term with an academic term at the Faculty of Education at Queen's University, and to gain teaching experience during other work-terms. Graduates are awarded a BEd degree from Queen's University as well as a BSc degree from the University of Waterloo.

A. HONOURS SCIENCE PROGRAMS
The Honours Science program allows students to study sciences in greater depth than permitted in the General Science program, but without as intense a degree of specialization as required in the more specialized programs such as Honours Biology, Honours Chemistry, etc. Students desiring a somewhat broader background in the Sciences might find this program more suitable than the more traditional specialized programs. However, students contemplating graduate study in the traditional disciplines following their undergraduate studies are advised to pursue the more specialized Honours programs.

There are five programs available that will lead to the degree of Bachelor of Science (Honours Science), plus Liberal Science, an Honours Science and Business program and Environmental Science with a variety of themes. They are:
Honours Science — Program One (Non-Specialized)

Admission to, and continuance in, Honours Science Program 1 requires a cumulative overall average of 60% and a cumulative average of 60% in all Faculty of Science courses.

In order to graduate in the Honours Science (non-specialized) program, the following requirements must be met:

1. Successful completion of 21.0 credits, exclusive of Year One lab credits, with a cumulative overall average of 60%, and a cumulative average of 60% in all Faculty of Science courses. Of the 21.0 credits that are required:
   a) at least 19.0 must be lecture credits;
   b) at least 12.0 credits must be Faculty of Science credits, of which 8.0 must be at or above the 200-level, and at least 4.0 of them other than any SCI credits must be at the 300- or 400-level.

2. At least 1.0 credit must be in MATH.

3. No more than 5.0 failed credits are allowed.

4. No more than 3.0 SCI credits may be applied to the program.

5. Unless permission to pursue this degree in part-time status has been granted by the Admissions Committee of the Faculty of Science, a student must have been enrolled full-time in two out of three years, one of which must be either Year Two or Three, and the other must be Year Four. Year Four of the program must be taken at the University of Waterloo.

The admissions committee may approve part-time status in this program for mature students if other commitments (e.g., employment) prevent full-time study. Approval will not be granted unless appropriate laboratory experience has been gained at the post-secondary level, through employment, or unless such experience will be gained during the degree program.

Year One

5.0 lecture credits, exclusive of laboratory credits.† At least two of (a), (b), (c), or (d) must be taken:
   a) BIOL 111/112, or two 200-level Biology courses;
   b) CHEM 120/123 plus labs;
   c) EARTH 121/122 plus labs;
   d) PHYS 111/112, or PHYS 121/122 plus labs.

† First year Chemistry, Physics, and Earth labs cannot be used for credit towards an Honours Science-Program One Degree.

Science

Academic Programs and Degree Requirements

Honours Programs

Liberal Science

Years Two, Three and Four

Normally, 4.0 Science credits plus 2.0 others are taken in Year Two and Three; in Year Four, 4.0 Science credits plus 1.0 other are taken.

Liberal Science (Science for the Generalist)

Director: Prof. G. Atkinson

This program is intended to present a broader perspective on science. It is a four-year Honours program, but students may earn a three-year degree with a Liberal Science label by meeting certain conditions as shown below. A Liberal Science Option is also available for students in other programs. The goal of the program is to produce a generalist with the capability of understanding specialist areas in science, and with some selected experiences in doing so in at least two sciences. This program operates under a Board of Studies representing the units in the Faculty of Science and the other faculties which contribute to the teaching of the Liberal Science Core Courses.

Students must apply to be admitted on completion of Year One. A minimum 60% average, both overall, and in all courses taken in the Faculty of Science will be required.

Admission to, and continuance in, the Liberal Science program requires a cumulative overall average of 60%, and 60% in all Science courses. Students required to withdraw from Honours Major Degree programs may apply for admission, but admission is not automatic and is granted on consideration of individual cases. No student will receive the degree from this program without spending one academic year leading to that degree enrolled in the program. A normal course load is 2.5 lecture credits per term plus any associated lab credits.

In order to graduate with a Liberal Science degree, the following requirements must be met:

1. Successful completion of 22.0 credits exclusive of lab credits with a cumulative average of 60%, including:
   a) 2.5 credits in Liberal Science Core Courses
   b) 0.5 credit in SCI 468
   c) 0.5 credit in SCI 469
   d) 1.5 credits in mathematics
   e) 2.0 credits in Year One offerings of two Science disciplines
   f) 2.0 credits in sequences of upper year courses, plus
   g) 2.0 credits in other upper year courses in those two Science disciplines
   h) 3.0 credits in languages, humanities or social sciences courses.

The remaining 8.0 credits may be freely selected in consultation with an advisor.

2. Apart from the required Liberal Science Core Courses, no more than 1.5 credit in SCI courses may be applied to the degree.
3. Students will be required to withdraw from the program upon failing 2.0 credits in an academic year, or 3.5 credits overall.
4. Students must apply for admission to the program, and spend at least one successful academic year in it, obtaining good standing.
5. Students admitted to this program must choose courses aimed at fulfilling these program requirements, and may not substitute courses aimed at gaining or regaining admission to some other program.
6. Students must take Year Four at the University of Waterloo, and must be enrolled full-time in Year Four and in either Year Two or Year Three.

Students enrolled in Liberal Science who decide to take a three-year degree with a Liberal Science label must:
1. Obtain credit for SCI 369 (and record their intention of doing so early in their penultimate term.)
2. Successfully complete 15 credits exclusive of lab credits with a cumulative average of 60%.
3. Fulfill other requirements for the Honours Degree in part as may be approved by the Board of Studies on a case-by-case basis. (A student enrolled in Liberal Science throughout Years Two and Three will be expected to show credits for at least four Liberal Science Core Courses or acceptable equivalents.)

The following is a list of courses from which students are advised to choose:

Liberal Science Core Courses
SCI 260, 261, 263, 265, 267, 268A-Z.

Year One Offerings
BIOL 230, 273
CHEM 120/120L, 123/123L
EARTH 121/122
PHYS 111/111L, 112/112L or 121/121L, 122/122L

Upper Year Sequences (suggested sequences joined by + signs)
BIOL 201 + 202, 210 + 211, 220 + 221, 240 + 241, 470 + 471
CHEM 212 or 218 + 312 or 313, 237, 254, 333, 266 + 267, 357 with the appropriate lab course: CHEM 314L, 237L, 266L, 356L respectively
EARTH 231 + either 221, 232, or 238, 235 + 238, 236 + 238
PHYS 226 + 246, 275, 368 + 369, 380 + 381 with appropriate lab courses

Students are explicitly excluded from:
BIOL 301 and 400-level courses not listed below
CHEM 400-level courses except by permission of instructor
EARTH 260 and 400-level courses
PHYS 400-level courses except by permission of instructor

Suggested additional Upper Year courses:
CHEM any other 200- or 300-level courses subject to prerequisites and antirequisites
EARTH 331, 332, 333, 336, 342, 345, 370
PHYS any other 200- or 300-level courses subject to prerequisites and antirequisites
SCI 250, 255, 453, 454, 462

Liberal Science Option
Students in any program may enrol in the Liberal Science Option. This Option provides an opportunity to gain some generalist education in science, and to address a number of aspects of the interaction of science and technology with society. If the requirements are fulfilled, the Option will be recorded on students’ transcripts upon graduation.

Students considering the Liberal Science Option should consult a Liberal Science advisor, and record their proposed Option program for approval by the Board of Studies. Subsequent changes to the program must also be recorded and approved.

In order to have a Liberal Science Option recorded, the following requirements must be met:
Successful completion of six approved term courses with an average of 60%, including:
  a) three Liberal Science Core Courses or approved alternatives. The third of these courses may by agreement be SCI 369 or 469.
  b) three other term courses proposed by the student and approved.

Students will submit written statements showing how the three Liberal Science Core Courses and three other courses form a coherent Option related to the student’s main program and overall educational plans. Appropriate courses may be found both in regular academic departments and in interdisciplinary programs such as Women’s Studies, and Society, Technology and Values. Specimen Option programs will be available as examples to assist students in planning a proposal.

Honours Science and Business
Program Advisor: Prof. H.M. Morrison

As high technology plays an increasingly greater role in society, there will be a growing need for graduates who have competence in the combined disciplines of science and business. The knowledge and skills which will be required by managers have never been greater. The modern manager must have a knowledge of finance, economics, accounting, marketing and organizational behaviour as well as the quantitative methods so deeply ingrained in the scientific method. A quantitative overview of science and acquired skills in the scientific method will be extremely useful in identifying and solving problems in the increasingly technology-oriented business world. Collection and
efficient handling of relevant data are crucial in the decision-making process.

For those students leaning towards administration in industry, the following program is recommended. The business, economics, accounting, finance and mathematics courses required in this program mirror some of the courses taken in graduate MBA programs. Credit for some of these courses may be allowed by some of the admitting universities offering MBA degrees.

This program is offered in both Regular and Co-operative systems of study. Students wishing to apply to the Co-op program should so preregister in March of their first year.

Admission to, and continuance in, Honours Science & Business requires a cumulative average of 65% in both Science and non-Science courses.

In order to graduate in the Honours Science and Business program the following requirements must be met:

1. Successful completion of 22.0 credits, exclusive of Year One Lab credits, with cumulative averages of 65% in both Science and non-Science courses. Of the 22.0 credits required:
   (a) at least 20.0 must be lecture credits;
   (b) at least 12.0 must be Faculty of Science credits of which 8.0 must be at or above the 200 level, and at least 4.0 of them other than any SCI credits must be at the 300 or 400 level.
2. No more than 5.0 failed credits are allowed.
3. No more than 2.0 SCI credits may be applied to the program.
4. A student must have been enrolled full-time in two out of three years, one of which must be either Year Two or Three, and the other must be Year Four. Year Four of the program must be taken at the University of Waterloo.
5. The following courses must be included:

   Year One:
   Two first-year Science courses*, BUS 111W, BUS 121W, MATH 113A/B, CS 100 or elective**, CS 102.

   Year Two:
   ECON 101, ECON 102, ACC 121, ACC 122 (or BUS 227W and BUS 247W instead of ACC 121, ACC 122), one first-year Science course*.

   Year Three:
   M SCI 211, M SCI 331, CS 330

   Year Four:
   M SCI 431 or M SCI 432

Honours Environmental Science

In order to graduate with the degree Honours BSc (Environmental Science) the following requirements must be met:

1. Successful completion of 20.0 lecture credits plus any corequisite lab credits. At least 12.0 credits must be Faculty of Science credits, of which at least 8.0 must be at or above the 200-level, and at least 4.0 of them other than any SCI credits must be at the 300- or 400-level
2. No more than 5.0 failed credits are allowed.
3. No more than 2.0 SCI credits may be applied to the degree.
4. Year Four and at least one of Years Two and Three must be taken in full-time study, and Year Four must be taken at the University of Waterloo.

Within Environmental Science, five choices and available:

- **Program 1: Basic Program**: fundamental science and current environmental concerns. The emphasis is on knowledge and skills needed to solve complex problems. This choice permits the greatest personal selection of courses to support your own goals.

- **Program 1: Ecology/Environmental Impact Assessment Theme**: Here the methods and principles of ecological assessment and the impacts of chemical, physical and biological changes on ecosystems, and toxicological effects of contaminants on receptor systems are studied.

- **Program 1: Environmental Analysis Theme**: Regulatory and managerial aspects of the environmental “industry” are examined.

- **Program 1: Water Resources Theme**: Surface and groundwater are studied, including biological and chemical aspects of water resources; planning environmental law and regulatory aspects of water resources, as are analytical and survey methods, ecology and community analysis.

- **Program 2 has an atmospheric science focus, offering an understanding of processes potentially dangerous to the atmosphere, including photochemical smog, acid rain, hydrocarbon emissions, ozone depletion, the greenhouse effect and the physics of atmospheric transport and radiation balance.**
Environmental Science Program 1:
Basic Program

Year One
BIOL 240 Fundamentals of Microbiology
BIOL 250 Ecology
CHEM 120 Physical & Chemical Properties of Matter
CHEM 120L Chemical Reaction Laboratory 1
CHEM 123 Chemical Reactions, Equilibria & Kinetics
CHEM 123L Chemical Reaction Laboratory 2
EARTH 126 Geological Engineering Concepts
ENV S 195 Intro to Environmental Studies
MATH 113, 113B or MATH 115A/B Calculus 1 & 2
Two electives (1.0 credit)
Recommended Electives: BIOL 241, 273; CS 102; STAT 202; GEOG 102

Year Two
BIOL 210 Introductory Invertebrate Zoology
BIOL 211 Introductory Vertebrate Zoology
BIOL 221 Plant Biology 2 - The Diversity of Plants
BIOL 230 Introductory Cell Biology
or CHEM 237 Introductory Biochemistry
CHEM 223 Analytical Chemistry
CHEM 223L Analytical Chemistry Laboratory 1
GEOG 201 Geomorphology and Soils
Four electives (2.0 credits)
Recommended Electives: BIOL 241; CHEM 266

Years Three and Four
BIOL 454 Environmental Toxicology 1
BIOL 457 Analysis of Communities
CHEM 356 General Physical Chemistry
CHEM 357 Physical Chemistry for the Life Sciences
CIV E 375 Water Quality Engineering
EARTH 123 Introduction to Hydrology
SCI 250 Environmental Geology
Thirteen electives (6.5 credits)

Note:
ENGL 210C is a strongly recommended elective in Year Two.

Environmental Science Program 1:
Ecology/Environmental Impact Assessment Theme

Years One and Two
BASIC PROGRAM required courses
Six electives (3.0 credit)
Recommended Electives: BIOL 241, 273; CS 102; STAT 202

Years Three and Four
BASIC PROGRAM required courses
Thirteen electives (6.5 credit)
Recommended Electives: BIOL 446, 447, 450, 451, 452, 455, 456, 457, 461; GEOG 356, 368

Environmental Science Program 1:
Environmental Analysis Theme

Years One and Two
BASIC PROGRAM required courses, including
BIOL 230
Six electives (3.0 credit)
Recommended Electives: ACC 121 (or equivalent);
BIOL 241; CHEM 266; ECON 101; STAT 202

Years Three and Four
BASIC PROGRAM required courses (BIOL 453 may replace 457)
Thirteen electives (6.5 credit)
Recommended Electives: BUS 387, 397, 477 (or equivalents); ECON 355; ENV S 178, 220, 352; STAT 220, 221, 322

Environmental Science Program:
Water Resources Theme

Years One and Two
BASIC PROGRAM required courses, including
CHEM 237
Six electives (3.0 credit)
Recommended Electives: BIOL 241, 273; CS 102; STAT 202; CIV E 221; GEOG 275

Years Three and Four
BASIC PROGRAM required courses plus BIOL 453
Twelve electives (6.0 credit)
Recommended Electives: BIOL 447, 450, 451; CIV E 472, 480, 486; EARTH 459; GEOG 358, 376; PHYS 369

Environmental Science Program 2:

Year One
MATH 115A/B must be selected, and PHYS 121, 121L, 122, 122L added to the BASIC PROGRAM of Program 1

Year Two
AM 250, BIOL 230, 241; CHEM 223, 223L, 266; PHYS 222, 223, 224L
Two electives (1.0 credits)
Recommended Electives: MATH 215; PHYS 249

Years Three and Four
BIOL 454; CHEM 254, 357, 357L; EARTH 123; PHYS 369; SCI 250
Fourteen Electives (7.0 credits)
Recommended Electives: AM 251, 343; BIOL 453 or 457; CHEM 212, 311, 320; GEOG 102, 309; M E 215, 351, 459, 571; PHYS 480

Note:
ENGL 210C is a strongly recommended elective in Year Two.
**Science**  
Honours Major Programs  
Departmental Programs – Biology

**Honours Biology & Environment and Resource Studies**  
**Honours Biology and Geography**

- **Co-operative:**  
  Honours Co-operative Biology  
  Honours’ Co-operative Biochemistry  
  Honours Co-operative Biochemistry (Biotechnology Option)  
  Honours Co-operative Biology and Chemistry  
  Honours Co-operative Biology/Business Economics

- **Honours Science Program Two (with specialization in Biology)**

- **Honours Science Program Two (Pre-Health-Professions Option)**

- **Minor in Biology**

**HONOURS MAJOR PROGRAMS - REGULAR**

Honours Biology

Program Advisors: Professors D. Barton, W.R. Hawthorn, P.E. Morrison, and Mr. N. Scott

Admission to, and continuance in, Honours Biology requires a cumulative average of 60% and a cumulative average of 65% in all Biology courses.

In order to graduate in the Honours Biology program, the following requirements must be met:

1. Successful completion of 21.0 credits;
2. At least a 0.75 credit in Biochemistry and a 0.75 credit in Organic Chemistry;
3. By the end of Year Two, students must have completed CS 102;
4. A student must have been enrolled full-time in two out of three years, one of which must be either Year Two or Three, and the other must be Year Four. Year Four of the program must be taken at the University of Waterloo;
5. Mandatory courses as listed below.

Also, any student who fails a Biology course during second or third year will not be permitted to continue in the program unless reinstated by the department.

**Year One**

1.5 Biology credits from the following: BIOL 210, 211, 220, 221, 230, 239, 240, 241, 250, 273  
CHEM 120/120L, and CHEM 123/123L  
Five electives (2.5 credits).

**Note:**  
Students who enter Year Two of Regular Honours Biology with 1.0 Biology credit from Year One are advised to complete the remaining 4.0 credits of 200-level Biology courses by the end of Year Two. This will usually mean that these students will have six lecture courses during one term of Year Two. BIOL 240 should be taken before BIOL 241.
Biology Themes
During third and fourth year, students may wish to specialize in certain recognized areas of biological sciences such as:
- Animal and Plant Physiology
- Aquatic Ecology
- Cell/Molecular Biology and Biotechnology
- Evolutionary Biology and Biosystematics
- Microbiology
- Pre Health-Professions
- Terrestrial Ecology
Appropriate 400-level courses have been selected to fit each of these areas, yet it is perfectly acceptable for any student to decide on an independent selection of courses, according to individual interests. Consult a Biology Undergraduate Officer for more details.

Year Two
3.5 Biology credits from the following: BIOL 210, 211, 220, 221, 230, 230, 240, 241, 250, 273
CHEM 266†/266L, and CHEM 237/237L
STAT 202

Year Three
At least 3.5 credits from the 400-level Biology courses (excluding BIOL 301)
Three electives (1.5 credits). (Chemistry courses and PHYS 301 are recommended)

Year Four
At least 3.0 credits from the 400-level Biology courses
Four electives (2.0 credits)
† Students contemplating a "Minor in Chemistry" must take Honours-level Chemistry courses (see page 14:29). CHEM 266, 267 and 228 will not count towards the Minor; the appropriate acceptable courses are CHEM 264, 265 and 220/220L respectively. Students are urged to check their plans for this Minor with the Undergraduate Officer in Chemistry.

Honours Biochemistry
Program Advisors: Professors L.J. Brubacher, Chemistry and M. Globus, Biology

This program allows specialization in either biochemistry with a chemical emphasis, or biochemistry with a physiological or microbiological emphasis. The program is also available in the Co-operative system of study.

Professional Standing
The program in Biochemistry fulfills the academic requirements for professional membership in the Chemical Institute of Canada.

Admission to, and continuance in, Honours Biochemistry requires a cumulative average of 60% and a cumulative average of 60% in Chemistry courses and 65% in Biology courses.

In order to graduate in the Honours Biochemistry program, the following requirements must be met:
1. Successful completion of 22.75 credits (including all required labs in Chemistry and Physics).
2. A student must have been enrolled full-time in two out of three years, one of which must be either Year Two or Three, and the other must be Year Four. Year Four of the program must be taken at the University of Waterloo.
3. Mandatory courses as listed below.
4. 7.0† credits from recommended, Years Three and Four electives.

Note
Students who elect to take BIOL 240 and BIOL 241 are advised that the preferred sequence is BIOL 240 followed by BIOL 241.

Year One
BIOL 230, 239
CHEM 121/12OL, and 125/123L, 129
PHYS 121/121L or 111/111L, and 112/112L
MATH 115A/B
Elective (0.5 credit)

Year Two
1.5 credits from 200-level Biology courses.
CHEM 212, 223, 223L, 224L, 254, 264, 265, 265L
STAT 202
Elective (0.5 credit)

Year Three
BIOL 436, 437
CHEM 233, 333, 334L, 357, 368, 368L
Four Electives * (2.0) from Groups below.

Year Four
Ten Electives * (5.0)† from Groups below.

* Years Three and Four Electives (7.0† credits from Groups A, B, and C, with at least 5.5 credits from Groups A and B, of which not less than 4.0 credits are from Group A.)

Group A
BIOL 428, 432X, 433X, 434, 438, 439, 440, 441, 442, 499A/B
CHEM 432, 433, 434, 435, 492A/B†

Group B:
BIOL 402, 403, 404, 423, 427X, 443, 444, 445, 448, 449, 454, 455, 470, 471, 473X
CHEM 312, 313, 323, 411, 412, 413, 425, 464, 465
PHYS 381, 480

Group C:
Free electives (not more than 1.5)
† Students electing CHEM 492A/B must earn 7.5 credits from groups A, B and C, with 5.5 credits in Year Four.

Honours Biochemistry (Biotechnology Option)
For program information see page 14:19.

Honours Biology and Chemistry
For program information see page 14:19.
Honours Biology/Business Economics
Program Advisors: Prof. M. Globus (Biology) and Prof. Eva Lau (Economics).

As technological developments are introduced at an ever-increasing pace, there is a strong demand for individuals with a depth of understanding of both the science of Biology and its implementation in the world of business and government. Decision makers often need to appreciate the underlying scientific issues as well as the economic ramifications of their decisions. Students interested in an interdisciplinary approach may wish to consider the Honours Biology/Business Economics program which is designed to prepare students for careers at the interface of the Biological Sciences and Business or Government, encompassing such diverse fields as food and agriculture, natural resources, biotechnology, the health-related industries and environmental toxicology.

This program is offered in both Regular and Co-operative systems of study. Admission to and continuance in Honours Biology/Business Economics requires a cumulative Biology Average of 65%, a cumulative Economics average of 70% and a cumulative overall average of at least 65%.

In order to graduate in the Honours Biology/Business Economics program, the following requirements must be met:

1. Successful completion of 21.0 credits;
2. Of the 21.0 credits required, 12.0 credits must be in Science;
   (a) 9.0 credits approved by the Department of Biology;
   (b) 3.0 credits in Chemistry including CHEM 120/12OL, CHEM 123/123L, CHEM 266/266L and CHEM 237/237L;
3. 7.5 credits must be taken in Economics, Accounting and Business;
4. Computer Science (CS 102);
5. 1.0 elective credits;
6. A student must have been enrolled full-time in two out of three years, one of which must be either Year Two or Three, and the other must be Year Four. Year Four of the program must be taken at the University of Waterloo;
7. Mandatory courses are listed below.

**Year One**
2.0 Biology credits from: BIOL 210, 211, 220, 221, 230, 239, 240, 241, 250, 273, CHEM 120/120L and 123/123L, ECON 101 and 102, ACC 123, CS 102

Science
Biology

**Year Two**
2.0 Biology credits from: BIOL 210, 211, 220, 221, 230, 239, 240, 241, 250, 273, CHEM 266/266L and 237/237L, ECON 201, 202, 211 and 221

**Year Three**
2.5 credits in Biology at the 400-level, ECON 231, and ECON 355 or ECON 344 (WLU), ACC 231
0.5 credits from the following: ECON 301, 302, 321, 341, 344, 345, 361, 401, 402, 403, BUS 352 W ** plus 0.5 credit elective (English 209 is recommended)

**Year Four**
2.5 credits in Biology at the 400-level
2.0 credits from ECON 301, 302, 321, 341, 344, 345, 361, 401, 402, 403, BUS 352 W ** plus 0.5 credit elective

* Students with no computer literacy should take CS 100 before CS 102.
** BUS 352W – is recommended.

Honours Biology and Environment and Resource Studies
Honours Biology and Geography
Program Advisor: Professor D. Barton, Biology

Admission to, and continuance in, either program requires an overall cumulative average of 60% with a cumulative average of 70% in the Faculty of Environmental Studies courses, and a cumulative average of 65% in Biology courses.

In order to graduate in either program, the following requirements must be met:

1. Successful completion of 21.0 credits;
2. Of the 21.0 credits required, 7.0 credits must be approved by the Dept. of Biology, and 6.5 credits must be in the appropriate department of the Faculty of Environmental Studies, or equivalent;
3. STAT 202, and CS 102;
4. CHEM 120/120L, CHEM 123/123L, CHEM 266/266L and CHEM 237/237L;
5. Students must have been enrolled full-time in two out of three years, one of which must be either Year Two or Three, and the other must be Year Four. Year Four of the program must be taken at the University of Waterloo. In exceptional cases for truly outstanding students, this program may be taken as a Co-operative option; however, it is the intention of the Biology Department that no more than five students be enrolled in any given year.

Since proper course selection in either program is critical, contact Professor D. Barton, Biology, for further details.
HONOURS MAJOR PROGRAMS - CO-OPERATIVE

Honours Co-operative Biology
Program Advisors: Professors D. Barton, W.R. Hawthorn, P.E. Morrison and Mr. N. Scott

The University of Waterloo offers a Co-operative Biology program designed to equip the graduating student with two years of work-related experience as well as a degree in Honours Biology. Applicants for Co-op Biology must fulfill the normal admission requirements for the Faculty of Science. The program has academic and work-terms scheduled as shown in Chapter 5.

During the work terms, students are assessed on their performance and are also required to write work reports. The program is aimed at making the student competitive in the job market without precluding entry into graduate school.

Admission to, and continuance in, Honours Co-operative Biology requires a cumulative average of 60% and a cumulative average of 65% in all Biology courses.

In order to graduate in the Honours Co-operative Biology program, the following requirements must be met:

1. Successful completion of 21.0 credits;
2. By the end of Year 2B, students must have completed the ten introductory Biology courses at the 200-level, and CS 102;
3. 13 400-level Biology courses;
4. Four satisfactory work-term reports;
5. Mandatory courses as listed below.

Note to All 1A Students
BIOL 230 is recommended for first year. BIOL 240 should be taken before BIOL 241.

Note to All 1B Students
Students should be aware that BIOL 239 and 273 must be taken during either the Winter or Spring Terms in even-numbered years and BIOL 211, 221 and 241 must be taken during either the Winter or Spring Terms in odd-numbered years.

Biology Themes
During third and fourth year, students may wish to specialize in certain recognized areas of biological sciences such as:

- Animal and Plant Physiology
- Aquatic Ecology
- Cell/Molecular Biology and Biotechnology
- Evolutionary Biology and Biosystematics
- Microbiology
- Pre Health-Professions
- Terrestrial Ecology

Appropriate 400-level courses have been selected to fit each of these areas, yet it is perfectly acceptable for any student to decide on an independent selection of courses, according to individual interests. Consult a Biology Undergraduate Officer for more details.

Stream 8
(Students who take Year 1B during Winter Term)

<table>
<thead>
<tr>
<th>Year 1A</th>
<th>Year 1B</th>
<th>Year 2B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td>Winter</td>
<td>Spring</td>
</tr>
<tr>
<td>BIOL 230</td>
<td>BIOL 1.0 or 1.5</td>
<td>BIOL - 1.0 or 1.5</td>
</tr>
<tr>
<td>BIOL 240</td>
<td>200-level credits.</td>
<td>200-level credits.</td>
</tr>
<tr>
<td>CHEM 120/120L</td>
<td>CHEM 123/123L</td>
<td>CHEM 237/237L</td>
</tr>
<tr>
<td>Electives -</td>
<td>Electives -</td>
<td>Electives - 1.0 or 0.5 credit.</td>
</tr>
<tr>
<td>1.0 credit.</td>
<td>1.0 or 0.5 credit.</td>
<td></td>
</tr>
<tr>
<td>Year 2A</td>
<td>Year 2B</td>
<td></td>
</tr>
<tr>
<td>Work Term</td>
<td>BIOL - 1.5 or 2.0</td>
<td>BIOL - 1.0 or 1.5</td>
</tr>
<tr>
<td>BIOL - 1.5 200-level</td>
<td>Electives - 0.5 credit.</td>
<td>200-level credits.</td>
</tr>
<tr>
<td>credits.</td>
<td>(CHEM 267 is recommended.)</td>
<td>CHEM 237/237L</td>
</tr>
<tr>
<td>CHEM 266L</td>
<td>Electives - 0.5 credit.</td>
<td></td>
</tr>
<tr>
<td>STAT 202</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 3A</td>
<td>Year 3B</td>
<td></td>
</tr>
<tr>
<td>Work Term</td>
<td>BIOL - 1.0 or 1.5</td>
<td>BIOL - 1.5 or 2.0</td>
</tr>
<tr>
<td>BIOL - 1.5 or 2.0</td>
<td>400-level credits.</td>
<td>400-level credits.</td>
</tr>
<tr>
<td>400-level credits.</td>
<td>CHEM 266L</td>
<td>CHEM 267 or CHEM 333 are recommended.</td>
</tr>
<tr>
<td>Electives - 0.5 credit.</td>
<td>Electives - 0.5 credit.</td>
<td></td>
</tr>
<tr>
<td>Work Term</td>
<td>Work Term</td>
<td>Work Term</td>
</tr>
</tbody>
</table>

Stream 4
(Students who take Year 1B during Spring Term)

<table>
<thead>
<tr>
<th>Year 1A</th>
<th>Year 1B</th>
<th>Year 3A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td>Winter</td>
<td>Spring</td>
</tr>
<tr>
<td>BIOL 230</td>
<td>BIOL Term</td>
<td>BIOL - 1.0 or 1.5</td>
</tr>
<tr>
<td>BIOL 240</td>
<td>Work Term</td>
<td>200-level credits.</td>
</tr>
<tr>
<td>CHEM 120/120L</td>
<td>CHEM 123/123L</td>
<td>CHEM 123/123L</td>
</tr>
<tr>
<td>Electives -</td>
<td>Electives - 1.0 or 0.5 credit.</td>
<td></td>
</tr>
<tr>
<td>1.0 credit.</td>
<td>1.0 or 0.5 credit.</td>
<td></td>
</tr>
<tr>
<td>Year 2A</td>
<td>Year 2B</td>
<td></td>
</tr>
<tr>
<td>Work Term</td>
<td>BIOL - 1.0 or 1.5</td>
<td>BIOL - 1.5 or 2.0</td>
</tr>
<tr>
<td>BIOL - 1.0 or 1.5</td>
<td>400-level credits.</td>
<td>400-level credits.</td>
</tr>
<tr>
<td>200-level credits.</td>
<td>CHEM 266L</td>
<td>CHEM 267 or CHEM 333 are recommended.</td>
</tr>
<tr>
<td>CHEM 228</td>
<td>Elective</td>
<td>Electives - 1.0 credit.</td>
</tr>
<tr>
<td>Elective</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 3A</td>
<td>Year 3B</td>
<td></td>
</tr>
<tr>
<td>Work Term</td>
<td>BIOL - 1.0 or 1.5</td>
<td>BIOL - 1.5 or 2.0</td>
</tr>
<tr>
<td>BIOL - 1.5 200-level</td>
<td>Electives - 0.5 credit.</td>
<td>400-level credits.</td>
</tr>
<tr>
<td>credits.</td>
<td>(CHEM 267 or</td>
<td>CHEM 267 or CHEM 333 are recommended.)</td>
</tr>
<tr>
<td>CHEM 237/237L</td>
<td>Electives - 0.5 credit.</td>
<td></td>
</tr>
<tr>
<td>STAT 202</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Work Term</td>
<td>Work Term</td>
<td>Work Term</td>
</tr>
</tbody>
</table>
### Stream 4 and Stream 8

<table>
<thead>
<tr>
<th>Fall</th>
<th>Winter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 4A</td>
<td>Year 4B</td>
</tr>
<tr>
<td>BIOL - 1.5 400-level credits</td>
<td>BIOL - 1.5 400-level credits</td>
</tr>
<tr>
<td>Electives - 1.0 credit</td>
<td>Electives - 1.0 credit</td>
</tr>
<tr>
<td>(Biochemistry courses are recommended)</td>
<td>(Biochemistry courses are recommended)</td>
</tr>
</tbody>
</table>

Since some fourth-year courses are offered in alternate years only, Biology major students are advised to plan their third and fourth-year courses simultaneously.

† Students contemplating a "Minor in Chemistry" must take Honours-level Chemistry courses (see page 14:29). CHEM 268, 267 and 228 will not count towards the Minor; the appropriate acceptable courses are CHEM 264, 265 and 220/220L respectively. Students are urged to check their plans for this Minor with the Undergraduate Officer in Chemistry.

### Honours Co-operative Biochemistry

Program Advisors: Professors L.J. Brubacher, Chemistry and M. Globus, Biology.

This program allows specialization in either biochemistry with a chemical emphasis, or biochemistry with a physiological or microbiological emphasis. The program is also available in the Regular system of study.

### Professional Standing

The program in Biochemistry fulfills the academic requirements for professional membership in the Chemical Institute of Canada.

Admission to, and continuance in, Honours Co-operative Biochemistry requires a cumulative average of 60%, a cumulative average of 60% in Chemistry courses, and a cumulative average of 65% in Biology courses.

In order to graduate in the Honours Co-operative Biochemistry program, the following requirements must be met:

1. Successful completion of 22.75 credits (including all required labs in Chemistry and Physics);
2. Mandatory courses as listed below;
3. 7.0 credits from recommended, Years Three and Four electives;
4. Four satisfactory work-term reports.

### Notes

1. Students should be aware that BIOL 239 must be taken in the Winter Term, or in the Spring Term of an even-numbered year. Students who elect to take BIOL 240 and BIOL 241 are advised that the preferred sequence is BIOL 240 followed by BIOL 241.

2. Students entering in the Fall of even-numbered years will take the same courses listed below but in a slightly different sequence.
### Streams 4 and 8

<table>
<thead>
<tr>
<th>Fall</th>
<th>Winter</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 4A</td>
<td>Year 4B</td>
<td>Year 3B</td>
</tr>
<tr>
<td>Electives* (2.5 credits) from Groups below</td>
<td>Electives* (2.5 credits) from Groups below</td>
<td></td>
</tr>
</tbody>
</table>

*Years Three and Four electives (7.0 credits from Groups A, B, and C, with at least 5.5 credits from Groups A and B, of which not less than 4.0 credits are from Group A.)*

**Group A:**
- BIOL 428, 432X, 433X, 434, 438, 439, 440, 441, 442, 499A/B
- CHEM 432, 433, 434, 435, 492A/B

**Group B:**
- CHEM 312, 313, 323, 411, 412, 413, 425, 464, 465
- PHYS 381, 480

**Group C:**
- Free electives (not more than 1.5)

†Students electing CHEM 492A/B must earn 7.5 credits from groups A, B, and C, with 5.5 credits in Year Four.

### Honours Co-operative Biochemistry (Biotechnology Option)

*Program advisors – Professors L.J. Brubacher, Chemistry and M. Globus, Biology*

The Biotechnology option comes into effect in Year Three. Although this option is set up in Co-operative format, it is also available for students in the Regular system of study.

### Stream 4

In Years One and Two, this Option follows the same sequence of courses as in the Honours Co-operative Biochemistry program, except that students must include BIOL 240, 241, and 273 in their program. Students should take BIOL 240 in Year 1A, BIOL 273 in Year 1B, and BIOL 241 in Year 2A as the BIOL electives.

<table>
<thead>
<tr>
<th>Fall Winter</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 2B Work Term</td>
<td>Year 3A</td>
</tr>
<tr>
<td>BIOL 437</td>
<td>BIOL 436</td>
</tr>
<tr>
<td>BIOL 440</td>
<td>BIOL 443</td>
</tr>
<tr>
<td>Electives* (2.5 credits) from Groups below</td>
<td>Electives* (1.5 credits) from Groups below</td>
</tr>
</tbody>
</table>

*Years Three and Four electives (4.5 credits from Groups A, B, and C, with at least 3.0 credits from Groups A and B, of which not less than 1.5 credits are from Group A)*

**Group A:**
- BIOL 428, 432X, 433X, 434, 438, 441, 442, 499A/B
- CHEM 432, 433, 434, 435, 492A/B

**Group B:**
- CHEM 312, 313, 323, 411, 412, 413, 425, 464, 465
- PHYS 381, 480

**Group C:**
- Free electives (not more than 1.5)

†Students electing CHEM 492A/B must earn 7.0 credits from groups A, B, and C, with 5.5 credits in Year Four.

### Honours Co-operative Biology and Chemistry

*Program Advisors: Professors L.J. Brubacher, Chemistry and M. Globus, Biology*

This program provides a strong grounding in both Biology and Chemistry. Those interested in teaching, or, in certain areas of research at the interface between Biology and Chemistry – such as bio-organic synthesis, chemical epidemiology, ecophysiology, environmental toxicology – may wish to select this program. Such students should consult one of the program advisors for assistance in designing a
program to suit their specific interests. Students should choose the 200-level Biology courses which are prerequisites for the 400-level topics they wish to study. Students who elect to take BIOL 240 and BIOL 241 are advised that the preferred sequence is BIOL 240 followed by BIOL 241. Although this program is presented in the Co-operative format, it is also available in the Regular system of study.

In order to graduate in the Honours Co-operative Biology and Chemistry program, the following requirements must be met:

1. Successful completion of 22.75 credits (including all required labs in Chemistry and Physics).
2. A student must have been enrolled full-time in two out of three years, one of which must be either Year Two or Three, and the other must be Year Four. Year Four of the program must be taken at the University of Waterloo.
3. Mandatory courses as listed below.
4. 2.0 credits from Years Three and Four electives.
5. 2.0 credits free electives

### Stream 8
(Students who take Year 1B in Winter Term)

<table>
<thead>
<tr>
<th>Fall</th>
<th>Winter</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1A</td>
<td>BIOL - 1.0 200-level credit</td>
<td>BIOL - 0.5 200-level credit</td>
</tr>
<tr>
<td>BIOL - 1.0 200-level credit</td>
<td>CHEM 121/120L</td>
<td>CHEM 121/120L</td>
</tr>
<tr>
<td>PHYS 121/121L or</td>
<td>CHEM 129</td>
<td>CHEM 257</td>
</tr>
<tr>
<td>111/111L</td>
<td>MATH 115A</td>
<td>Elective (0.5)</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 2A</th>
<th>Work Term</th>
<th>Year 2B</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 0.5 200-level credit</td>
<td>BIOL - 0.5 200-level credit</td>
<td>BIOL - 0.5 200-level credit</td>
</tr>
<tr>
<td>CHEM 212</td>
<td>CHEM 223/223L</td>
<td>CHEM 223/223L</td>
</tr>
<tr>
<td>CHEM 264</td>
<td>CHEM 265/265L</td>
<td>CHEM 265/265L</td>
</tr>
<tr>
<td>STAT 202</td>
<td>Unavailable</td>
<td>Unavailable</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Work Term</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 3A</td>
<td>BIOL - 1.0 400-level credit</td>
<td>BIOL - 1.0 400-level credit</td>
</tr>
<tr>
<td>BIOL - 1.0 400-level credit</td>
<td>CHEM 254</td>
<td>CHEM 333</td>
</tr>
<tr>
<td>CHEM 333/334L</td>
<td>Elective* (0.5)</td>
<td>Elective* (0.5)</td>
</tr>
</tbody>
</table>

### Streams 4 and 8

<table>
<thead>
<tr>
<th>Year 4</th>
<th>BIOL - 2.5 400-level credits</th>
<th>Electives (1.5)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Electives (1.0)</td>
</tr>
</tbody>
</table>

*Selected from 400-level BIOL courses or CHEM 313, 323, 411, 412, 413, 425, 432, 433, 434, 435, 464, 465, 492A/B†
†Students electing CHEM 492A/B must earn 2.5 credits from the electives* above.

### Honours Co-operative Biology/Business Economics

*Program Advisors: Prof. M. Globus (Biology) and Prof. Eva Lau (Economics). See page 14:16.*

### HONOURS SCIENCE PROGRAM TWO (With Specialization in Biology)

*Program Advisors: Professors D. Barton, W.R. Hawthorn, P.E. Morrison, and Mr. N. Scott.*

Admission to, and continuance in, Honours Science - Program Two requires an overall cumulative average of 60% and a cumulative average of 65% in Biology courses.

In order to graduate in the Honours Science program, with specialization in Biology, the following requirements must be met:

1. Successful completion of 21.0 credits.
   Of the 21.0 credits that are required:
   a) at least 19.0 must be lecture credits;
   b) at least 13.5 must be Faculty of Science credits;
2. at least 0.75 credit of biochemistry and 0.75 of organic chemistry;
3. 1.0 credit in MATH is required, of which 0.5 must be CS 102.
4. No more than 3.0 SCI credits may be applied to the program.
5. A student must have been enrolled full-time in two out of three years, one of which must be either Year Two or Three, and the other must be Year Four. Year Four of the program must be taken at the University of Waterloo.
6. Mandatory courses as listed below.
Year One
1.0 credit from the following: BIOL 210, 211, 220, 221, 230, 239, 240, 241, 250, 273
CHEM 120/120L and CHEM 123/123L
CS 102
Electives (2.5)

Year Two
3.0 credits from BIOL 210, 211, 220, 221, 230, 239, 240, 241, 250, 273
CHEM 266T/266L and 237/237L
Electives (1.0)

Year Three
at least 3.0 credits from the 400-level Biology courses
0.5 credit in Science
Electives (1.5)

Year Four
4.0 Science credits at least 2.0 of which are Biology
credits from the 400-level
Electives (1.0)
† Students contemplating a "Minor in Chemistry" must take
Honours-level Chemistry courses (see page 14:29). CHEM 266, 267 and 228 will not count towards the Minor; the appropriate acceptable courses are CHEM 264, 265 and 220/220L respectively. Students are urged to check their plans for this Minor with the Undergraduate Officer in Chemistry.

HONOURS SCIENCE PROGRAM TWO (Pre-Health-Professions Option)
Program Advisors: D. Barton, W.R. Hawthorn, P.E. Morrison and Mr. N. Scott.

This program combines the Honours Science Program Two core with specific courses in biology, chemistry, physics and statistics. Electives are recommended from health, kinesiology, physics, psychology, science, and sociology. It is suitable preparation for work in medicine, dentistry, physiotherapy, radiotherapy, and chiropractic, or for the student whose interests develop into graduate study in the health disciplines. Students are strongly urged to consult the admission requirements of the professional schools of interest to aid their choice of electives.

Admission to, and continuance in, Honours Science Program Two (Pre-Health-Professions Option) requires an overall cumulative average of 60% and a cumulative average of 65% in Biology courses. In order to graduate with this Option, the following requirements must be met:

1. Successful completion of 21.0 credits;
   of the 21 credits that are required,
   a) at least 19.0 must be lecture credits;
   b) at least 13.5 must be Faculty of Science credits;
2. No more than 3.0 SCI credits may be applied to the program;
3. A student must have been enrolled full-time in two out of three years, one of which must be either Year Two or Three, and the other must be Year Four. Year Four of the program must be taken at the University of Waterloo.
4. Mandatory courses as listed below.
5. A minimum of 4.0 lecture credits from the recommended electives.
6. For students interested in Optometry at the University of Waterloo, consult page 14:39 for requirements.
HONOURS SCIENCE PROGRAM TWO (PRE-HEALTH-PROFESSIONS OPTION)

**Year 1 (Fall)**
- BIOL 230
- BIOL 240
- CHEM 120/120L
- 1.0 credit elective
- Recommended electives:
  - HLTH 101, PSYCH 101, PHYS 111/111L

**Year 1 (Winter)**
- BIOL 241
- BIOL 273
- CHEM 123/123L
- 1.0 credit elective
- Recommended electives:
  - HLTH 102, SOC 101, PHYS 112/112L

**Year 2 (Fall)**
- BIOL 201
- BIOL 470 *
- CHEM 266/266L
- STAT 202
- 0.5 credit elective
- Recommended electives:
  - HLTH 220, SOC 248, SOC 249

**Year 2 (Winter)**
- BIOL 239
- BIOL 471
- CHEM 237/237L
- CS 102
- 0.5 credit elective
- Recommended electives:
  - PSYCH 261, SCI 255

**Year 3 (Fall)**
- BIOL 402
- BIOL 437
- BIOL 441
- PHYS 480
- 0.5 credit elective
- Recommended electives:
  - HLTH 300, HLTH 341, HLTH 349

**Year 3 (Winter)**
- BIOL 404
- BIOL 436
- CHEM 267/267L
- 1.0 credit elective
- Recommended electives:
  - HLTH 346, HLTH 348, HLTH 340,
  - PSYCH 361, PSYCH 335, PSYCH 357

**Year 4 (Fall)**
- BIOL 403
- CHEM 333
- 0.5 credit Science
- 1.5 credit elective
- Recommended electives:
  - HLTH 442

**Year 4 (Winter)**
- BIOL 442
- BIOL 444
- BIOL 473X
- 1.0 credit elective
- Recommended electives:
  - KIN 410, HLTH 407, KIN 416, BIOL 439, PHYS 481

**Note:** A Pre-Health-Professions Option is also offered by the Department of Health Studies, and a suitable set of preparatory courses may be taken within a Kinesiology degree program.

* Prerequisites BIOL 210 and BIOL 211 for BIOL 470 are not required for students enrolled in the Honours Science Program Two (Pre-Health-Professions Option).

† Students contemplating a "Minor in Chemistry" must take Honours-level Chemistry courses (see page 14:29). CHEM 266, 267 and 228 will not count towards the Minor; the appropriate acceptable courses are CHEM 264, 265 and 220/220L respectively. Students are urged to check their plans for this Minor with the Undergraduate Officer in Chemistry.

**MINOR IN BIOLOGY**
In order to graduate with a Minor in Biology, the following requirements must be met:

1. Successful completion of 5.0 Biology credits, at least 2.5 of which must be at the fourth-year level.
2. A minimum average of 65% is required in Biology courses.
3. Students are advised to see an Undergraduate Advisor in the Department of Biology.
Chemistry

The following programs are offered in the Chemistry department:

- **Honours Major Programs**
  
  **Regular:**
  - Honours Biochemistry - (see page 14:15)
  - Honours Biochemistry (Biotechnology Option) – (see page 14:19)
  - Honours Biology and Chemistry – (see page 14:19)
  - Honours Chemistry
  - Honours Chemistry and Environment and Resource Studies
  - Honours Chemistry (with Options)
    - a) Environmental Studies Option
    - b) Mathematics Option
    - c) Thesis Option
  - Honours Chemical Physics (Joint with Physics Department)

  **Co-operative:**
  - Honours Co-operative Biochemistry - (see page 14:18)
  - Honours Co-operative Biochemistry (Biotechnology Option) – (see page 14:19)
  - Honours Co-operative Biology and Chemistry (see page 14:19)
  - Honours Co-operative Applied Chemistry
  - Honours Co-operative Applied Chemistry (with options)
    - a) Mathematics Option
    - b) Thesis Option
  - Honours Co-operative Chemical Physics (Joint with Physics Department)

- **Honours Science – Program Three (with specialization in Chemistry)**

- **Minor in Chemistry**

**Program Flexibility for Excellent Students**

An excellent student in second or third year in any Honours Chemistry program, Co-operative or Regular, may propose a variation in the schedule of courses required for the degree. Proposals are entertained at the end of each term from students who have a cumulative Chemistry average of 80% and a cumulative average over all courses of 80%. Academic performance is reviewed each term by an advisory committee.

**Professional Standing**

The Honours Major programs fulfill the academic requirements for professional membership in the Chemical Institute of Canada.

**Note to all Honours Chemistry Students:**

Honours Chemistry students (all programs) may not elect to take these General program courses for degree credit:

CHEM 218, 219, 266, 267, 316, 366

**Electives**

The following chart (page 14:24) outlines proposed offerings of technical electives with Chemistry content from which Honours students should choose their required electives.
## Technical Electives with Chemistry Content

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</table>

## Electives Relevant to Industrial Employment

Students contemplating careers in industry should consider some of these courses:

<table>
<thead>
<tr>
<th>Statistics</th>
<th>Environment</th>
<th>Management Science</th>
<th>Economics</th>
<th>Computing</th>
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<tbody>
<tr>
<td>STAT 204, 304</td>
<td>ERS 337</td>
<td>M SCI 211</td>
<td>ECON 101, 102, 201, 202</td>
<td>CS 212, 230, GEN E 121</td>
</tr>
<tr>
<td>Writing</td>
<td>Law</td>
<td>Business (WLU)</td>
<td>Accounting</td>
<td>Microprocessors</td>
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<tr>
<td>ENGL 210A or C</td>
<td>PSCI 291, 292, ENV S 201, ACC 231</td>
<td>BUS 352, 362, 382, 383</td>
<td>ACC 121, 122</td>
<td>E &amp; CE 222, 223, 427, PHYS 353</td>
</tr>
</tbody>
</table>

## Notes

* indicates recommendation for Applied Chemistry students.
† indicates special permission required from the Associate Chairman for Undergraduate Studies in the Chemical Engineering Department.
** Normally one of these courses will be offered each Winter term. See Undergraduate Advisor for details.
*** One of these courses will be offered in most years. See Undergraduate Advisor for details.
HONOURS MAJOR PROGRAMS – REGULAR

Honours Biochemistry
(see page 14:15)

Honours Biochemistry (Biotechnology Option)
(see page 14:19)

Honours Biology and Chemistry
(see page 14:19)

Honours Chemistry
Program Advisor: Professor G.E. Toogood
Admission to, and continuance in, Honours Chemistry requires a cumulative average of 60% and a cumulative average of 60% in all Chemistry lecture courses each term.

In order to graduate with an Honours Chemistry degree, the following requirements must be met:

1. Successful completion of 24.5 credits including 5.5 lab credits;
2. In Years Three and Four, students must choose six Chemistry courses from the list of Technical electives with Chemistry content (see page 14:24);
3. In Year Three or Four, students must take one of CHEM 450, 451, 458, 459;
4. In Year Two students must take, as their Physics elective, one of PHYS 222/252L (or 252/252L), 226/256L (or 256/256L), or 259/259L.
5. Students are encouraged to include in their program an ethics course such as STV 100, PHIL 226, PHIL 215, SCI 263, SCI 265.
6. Failure of more than one course in the field of specialization will result in the requirement to withdraw from the program. Students may petition for re-admission, such re-admission to be at the discretion of the Chemistry Undergraduate Committee and in exceptional circumstances only;
7. Students must have been enrolled full-time in Year Four, and in either Year Two or Three. Year Four of the program must be taken at the University of Waterloo;
8. Mandatory courses as listed below;

Year One
Fall:
CHEM 121/120L
PHYS 121/121L
MATH 113A
Electives (1.0)

Winter:
CHEM 125/123L, 129
PHYS 112/112L
MATH 113B
Elective (0.5)

Year Two
Fall:
CHEM 10, 223/223L, 254, 264

MATH 215
PHYS elective (0.75) (Fall or Winter, see note 4 above)

Winter:
CHEM 10, 212, 224L, 256, 265/265L
Two Electives (1.0)

Year Three
Fall:
CHEM 10, 312, 312L, 359/355L, 368
Two electives (1.0)

Winter:
CHEM 10, 313, 323, 358L, 368L
Three electives (1.5) (see note 3 above)

Year Four
CHEM 10, 492A/B (1.5)
Eight electives (4.0)

Honours Chemistry and Environment and Resource Studies
Program Advisors: Professors G.E. Toogood (Chemistry) and S.C. Lerner (Environment and Resource Studies)

Admission to, and continuance in, Honours Chemistry and Environment and Resource Studies requires an overall cumulative average of 60% and a cumulative average of 60% in all Chemistry lecture courses each term. A 70% average is required in all Faculty of Environmental Studies courses.

In order to graduate with an Honours Chemistry and Environment and Resource Studies degree, the following requirements must be met:

1. Successful completion of 18.0 approved lecture credits, 2.5 Chemistry laboratory credits, and either CHEM 492A/B or ERS 490A/B, as detailed below.
2. The student must have been enrolled full-time in Year Four and in either Year Two or Three. Year Four must be taken at the University of Waterloo;
3. Mandatory courses as listed below.

Year One
CHEM 120 or 121, 123 or 125, 120L/123L, 129
ERS 100, 101, 150
Biology – two 200-level courses
MATH 115A/B
ENV S 195

Upper Years
CHEM – 7.5 lecture credits including CHEM 212, 223, 237, 254, 264, 265, 323, 357, 368, and 3.0 lecture credits from appropriate 300- and 400-level courses in the Chemistry Department,
2.0 laboratory credits: CHEM 223L, 224L, 237L, 265L, 355L, 368L

(continued on next page)
ERS - 4.0 credits: ENV S 200, ERS 290, 291, 295, 390A/B, 396 and 400
MATH 215
one of STAT 202, 204 or ENV S 178
CHEM 492A/B or ERS 490A/B

Honours Chemistry (with Options)

a) Honours Chemistry (Environmental Studies Option)
Program Advisor: Professor G.E. Toogood

This program supplements the Honours Chemistry core with courses to familiarize the student with legal, economic and social aspects of environmental control and resource management.

Admission to, and continuance in, Honours Chemistry (Environmental Studies Option) requires an overall cumulative average of 60%. In addition, a 60% average must be obtained in all Chemistry lecture courses each term. A 70% average is required in all Environmental Studies courses.

In order to graduate with an Honours Chemistry (Environmental Studies Option) degree, the following requirements must be met:

1. Successful completion of 24.5 credits including 5.0 lab credits;
2. ENV S 195 plus 3.5 credits from PLAN 156 or GEOG 102, ENV S 200, 201, 202, 220; GEOG 367; ERS 241, 337, 336.
3. Students are encouraged to include in their program an ethics course such as STV 100, PHIL 215, PHIL 226, SCI 263, SCI 265.
4. Failure of more than one course in the field of specialization will result in the requirement to withdraw from the program. Students may petition for re-admission, such re-admission to be at the discretion of the Chemistry Undergraduate Committee and in exceptional circumstances only;
5. Students must have been enrolled full-time in Year Four, and in either Year Two or Three. Year Four of the program must be taken at the University of Waterloo;
6. Mandatory courses as listed below;

Year One
Students must take the same courses as stated in the Honours Chemistry program. (page 14:25)

Year Two
Students must take the same courses as stated in the Honours Chemistry program (page 14:25)

Year Three
Fall:
CHEM 312, 312L, 355L, 368
STAT 204
Two Electives (1.0)

Winter:
CHEM 10, 313, 323, 357, 368L
Two electives (1.0)

Year Four
CHEM 10, 492A/B
ENV S 201
2.0 Chemistry credits. (CHEM 237/237L, 412 and 455 are recommended)
Four electives (2.0)

b) Honours Chemistry (Mathematics Option)
Program Advisor: Professor F.R. McCourt

This program combines the Honours Chemistry core with an enriched background in mathematics. It is suitable preparation for work in Theoretical Chemistry or Chemical Physics, or for the student whose interests and abilities lie in a mathematical direction.

Students wishing to follow this program on the Co-operative system of study should first speak to Professor McCourt and to Mr. R.A. Pullin of the Department of Co-operative Education and Career Services.

Admission to, and continuance in, Honours Chemistry (Mathematics Option) requires an overall cumulative average of 60%. In addition, a 60% average must be obtained each term in all Chemistry lecture courses. A 60% average is required in all Mathematics courses.

In order to graduate with an Honours Chemistry (Mathematics Option) degree, the following requirements must be met:

1. Successful completion of 23.5 credits including 4.5 lab credits;
2. In Year Two students must take, as their Physics elective, one of PHYS 222/252L (or 252/252L), 226/256L (or 256/256L), or 259/259L.
3. Students are encouraged to include in their program an ethics course such as STV 100, PHIL 215, PHIL 226, SCI 263, SCI 265.
4. Failure of more than one course in the field of specialization will result in the student being required to withdraw from the program. Students may petition for re-admission, such re-admission to be at the discretion of the Chemistry Undergraduate Committee and in exceptional circumstances only;
5. The student must have been enrolled full-time in Year Four, and in either Year Two or Year Three. Year Four must be taken at the University of Waterloo;
6. Mandatory courses as listed below;

Year One
Fall:
CHEM 121/120L
PHYS 121/121L
MATH 115A, 114 (or 136, Winter)
CS 102

(continued on next page)
Honours Chemical Physics (Joint with Physics Department)

Program Advisors: Professors W.K. Liu (Physics) and J.J. Sloan (Chemistry).

Chemical Physics is an emerging scientific discipline which includes roughly equal parts of both the traditional fields of Chemistry and Physics.

Students wishing to follow this program in the Co-operative system of study should first speak to Professor Liu (Physics), Professor Sloan (Chemistry), or Mr. R.A. Pullin (Department of Co-operative Education and Career Services).

Admission to, and continuance in this program requires an overall cumulative average of 60%. In addition, a 60% average must be obtained in all Mathematics, Chemistry and Physics courses attempted in each term.

In order to graduate from this program, the following requirements must be met:

1. Successful completion of 21.75 credits, including 5.0 laboratory credits.
2. Full-time enrolment in Year Four and either Year Two or Year Three. Year Four must be taken at the University of Waterloo.
3. Persons failing more than one Mathematics, Chemistry or Physics course will be required to withdraw from the program. Students may petition for re-admission, such re-admission to be at the discretion of the program advisors, and in exceptional circumstances only.
4. The courses identified in the core program must be taken. Students are encouraged to select electives from the lists of recommended electives, but other choices may be made in consultation with the program advisors.
Honours Co-operative Applied Chemistry

*Program Advisor: Professor G.E. Toogood*

This program, which offers the Honours Chemistry courses integrated with six four-month work terms, extends over five years instead of four. Information about the Co-operative system and the Department of Co-operative Education and Career Services can be found in Chapter 5. Two streams of students study and work in alternate terms starting at the end of the 1A term, and recombine at the beginning of the 4A term to take Year Four together and graduate together in the Spring.

Admission to, and continuance in, Honours Co-operative Applied Chemistry requires an overall cumulative average of 60%. In addition, students must achieve a 60% average in all Chemistry lecture courses each term.

In order to graduate with an Honours Co-operative Applied Chemistry degree, the following requirements must be met:

1. Successful completion of 24.5 credits including 5.5 lab credits;
2. In Years Three and Four, students must choose six Chemistry courses from the list of Technical Electives with Chemistry Content (see page 14:24);
3. In Year Three or Four, students must take one of CHEM 450, 451, 458, 459;
4. In Year Two students must take, as their Physics elective, one of PHYS 222/252L (or 252/252L), 226/256L (or 256/256L), or 259/259L.
5. Students are encouraged to include in their program an ethics course such as STV 100, PHIL 215, PHIL 226, SCI 263, SCI 265.
6. Failure of more than one course in the field of specialization will result in the requirement to withdraw from the program. Students may petition for re-admission, such re-admission to be at the discretion of the Chemistry Undergraduate Committee and in exceptional circumstances only;
7. Successful completion of a minimum of four work terms, and submission of a minimum of four satisfactory work reports;
8. Mandatory courses as listed below;

**Honours Co-operative Biochemistry**

(continued on next page)
Fall Work Term

Year 3B CHEM 10, 312, 323, 359/355L, 368L Electives (1.0)

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<th>Spring Work Term</th>
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<td>Year 2A CHEM 10, 212, 223/223L, 256, 264 MATH 215</td>
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<td>MATH 115A</td>
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<td>Year 3A CHEM 10, 313, 312L, 355L, 368L Electives (1.5) (see note 3 above)</td>
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<td>Electives (1.0)</td>
<td>Work Term</td>
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<tr>
<td>Work Term</td>
<td>CHEM 10, 224L, 254, 265/265L PHYS elective (see note 4 above) Electives (1.0)</td>
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Both Stream 4 and Stream 8

Year 4 (Fall and Winter) CHEM 10, 492A/B Eight Electives (4.0)

HONOURS SCIENCE PROGRAM THREE (With Specialization in Chemistry)

In order to graduate with an Honours Science Program Three degree, the following requirements must be met:

1. Successful completion of 23.0 credits, including at least 20.0 lecture credits and 14.0 credits in the Faculty of Science;
2. At least 0.25 lab credit and 1.0 lecture credit in each of the following areas of Chemistry: Analytical, Inorganic, Organic, Physical, plus further lab credits to make a total of 2.0 lab credits. Wherever possible, the laboratory chosen should accompany the appropriate lecture course;
3. No more than 5.0 failed credits are allowed;
4. No more than 3.0 SCI credits may be applied to the program;
5. Students must have been enrolled full-time in Year Four, and in either Year Two or Three. Year Four of the program must be taken at the University of Waterloo;
6. Mandatory courses as listed below.

Year One

PHYS 111/112 and 111L/112L or PHYS 121/122 and 121L/122L
CHEM 120/123 or 121/125, 120L/123L, 129
MATH 113A/B Three Electives (1.5)

Year Two

3.0 Chemistry lecture credits, at least 2.0 of which must be chosen from: CHEM 212, 223, 254, 256, 264, 265
1.0 lecture credit chosen from Physics, Biology or Earth Sciences courses
Two Electives (1.0)
CHEM 10

Year Three

3.0 Chemistry lecture credits at the 300-level or higher
1.0 lecture credit chosen from Physics, Biology or Earth Sciences courses
Two Electives (1.0)
CHEM 10

Year Four

2.0 Chemistry credits at 300-level or higher (at least 1.0 at 400-level)
2.0 lecture credits from Biology, Chemistry, Earth Sciences or Physics
Two Electives (1.0)
CHEM 10

MINOR IN CHEMISTRY

In order to graduate with a Minor in Chemistry the following requirements must be met:

- The following courses must be taken, with a minimum cumulative average of 60% in these courses:
  1) CHEM 120/123 or 121/125, 120L/123L, 129;
  2) A minimum of 3.0 lecture credits from 200-level or higher Honours-level Chemistry courses, of which a minimum of 1.0 lecture credit must be from 300- or 400-level Chemistry courses;
  3) 0.5 lab credits beyond Year One appropriate to the lecture credits chosen.

Students are urged to check their plans with an Undergraduate Officer in Chemistry.
Earth Sciences

The following programs are offered in the Earth Sciences Department:

- **Honours Major Programs**
  
  **Regular:**
  - Honours Earth Sciences (Geology Option)
  - Honours Earth Sciences (with Options)
    - a) Geography Option
    - b) Economics Option
  
  **Co-operative:**
  - Co-op Applied Earth Sciences (Environmental Hydrogeology Option)
  - Co-op Applied Earth Sciences (Geology Option)
  - Co-op Applied Earth Sciences (Geophysics Option)

- **Honours Science Program Four (with a specialization in Earth Sciences)**

- **Minor in Earth Sciences**

The first four programs provide academic preparation for students intending to pursue careers as professional geologists. Honours Science, with a specialization in Earth Sciences, provides a less intense specialization in Earth Sciences and is intended primarily for those wanting a geological background for careers in other areas, e.g. teaching, business management, civic administration, finance, specialized sales, agriculture, etc.

**HONOURS MAJOR PROGRAMS**

Admission to, and continuance in, all Earth Sciences Honours Major Programs requires an overall cumulative average of 60%, and a cumulative major average of 65%.

In order to graduate in any of the four Honours Major Programs, the following requirements must be met:

1. Successful completion of 42 one-term courses (plus additional Year One and Two labs);
2. In Year One and Two, science courses must be taken with the lab if an optional lab is available;
3. Failure of more than one course in the field of specialization will result in the requirement to withdraw from the program;
4. Mandatory courses as listed under the specific programs.

A breakdown of course-type groupings for each program is provided below:

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<tr>
<td>100-level Sci. Math Core</td>
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<td>Arts Core</td>
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<td>200-level Math, CS or Physics</td>
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<td>Geography/ Environmental Studies</td>
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<td>Science/ Mathematics Electives¹</td>
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<td>Unrestricted Elective</td>
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<td>3</td>
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<td>Non-credit field courses</td>
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</table>

¹Excluding SCI courses; optional Labs must be taken. Students who plan to do graduate work in hydrogeology are advised to take MATH 213A/B or CIV E 221 during their fourth year.

Students in programs other than the Geophysics Option may count one Geography remote sensing course as a Science/Mathematics elective; Geophysics Option students may count up to three Geography remote sensing courses under this category.
HONOURS MAJOR PROGRAMS - REGULAR

Honours Earth Sciences (Geology Option)

Year One
EARTH 121/122 and 121L/122L
CHEM 120/123 and 120L/123L
PHYS 121/122 and 121L/122L
CS 102
MATH 113A/B
One elective

Year Two
EARTH 221, 231, 232, 235, 236, 238
ENVS 200
GEOG 202 and one of GEOG 208, 275 or 309
One elective

Year Three
EARTH 331, 332, 333, 336, 342, 345, 370, 390
ENGL 210C
Two Geography electives
Two unrestricted electives

Year Four
EARTH 427, 436A/B, 440, 490, plus two term courses from 400-level Earth Sciences courses
Three Geography electives from 300- or 400-level courses
One unrestricted elective

Honours Earth Sciences (Geography Option)

In addition to the requirements for all Honours Major programs listed on page 14:30, Honours Earth Sciences/Geography Option students must meet the following requirements:

1. In addition to the 42 term courses required for credit, two field courses must be taken;
2. Students must maintain a 70% average in all Geography courses.

Geography Electives:
In selecting 200-, 300-, and 400-level Geography courses, five term courses from one or more of the following sequences should be chosen:

Cartography Sequence
GEOG 160, 360, 403, 404

Air Photo-Remote Sensing Sequence
GEOG 275, 375, 470, 471

Resource Management Sequence
GEOG 303, 356, 357, 358, 359, 414, 461

Year One
EARTH 121/122, 121L/122L
CHEM 120/123 and 120L/123L
GEOG 101/102
CS 102
either PHYS 111/112 and 111L/112L or BIOL 111/112 or equivalent, plus one elective.

Year Two
EARTH 221, 231, 232, 235, 236, 238
ENVS 200
GEOG 202 and one of GEOG 208, 275 or 309
One elective

Year Three
EARTH 331, 332, 333, 336, 342, 345, 370, 390
ENGL 210C
Two Geography electives
Two unrestricted electives

Year Four
EARTH 427, 436A/B, 440, 490, plus two term courses from 400-level Earth Sciences courses
Three Geography electives from 300- or 400-level courses
One unrestricted elective

Honours Earth Sciences (Economics Option)

This program is intended for Earth Sciences students who wish to take additional courses in Economics and Business. It will be of particular interest for those who intend to pursue an MBA or who anticipate careers in management or entrepreneurial areas. Students must maintain a 65% average in both Earth Sciences and Economics courses.

Economics courses:
Required courses are ECON 101, 102, 201 and 355. Two additional courses are required, with no more than one from each of the following groups:
ECON 241 or 341, BUS 111W or 121W (offered at WLU), M SCI 211
A course in entrepreneurship.

Elective Courses:
Of the seven elective courses four must be from MATH/SCIENCE, one from ARTS and two from unrestricted categories.

Year One:
EARTH 121/122 and 121L/122L
CHEM 120/123 and 120L/123L
PHYS 121/122 and 121L/122L
CS 102
MATH 113A/B
ECON 101

Year Two:
EARTH 221, 231, 232, 235, 236, 238
ECON 102, 201
One elective

Year Three:
EARTH 331, 332, 333, 345, 370, 390
One other 300-level Earth Sciences course
ECON 355
ENGL 210C
One Economics elective
Three other electives
Year Four:
EARTH 427, 436A/B, 490
Three other 400-level Earth Sciences courses
One Economics elective
Three electives

CO-OPERATIVE APPLIED EARTH SCIENCES
For both of the Co-operative Applied Earth Sciences programs offered, a good academic training, as well as considerable practical experience is gained.

Work term reports must be submitted within three weeks of the first day of lectures of the following academic term. Normally a work-term report must be prepared during a student’s first work-term. Two satisfactory reports must have been received before the student commences work-term 3B. Four satisfactory reports must have been received by academic term 4A. See Chapter 5 for further information regarding the Co-operative system of study, and page 5:4 for the Co-op chart outlining the normal progression for Co-operative Earth Sciences students.

Transfer to a regular Honours program will be permitted if all requirements of the Co-op program have been met up to the time of the transfer.

Co-operative Applied Earth Sciences (Geology Option)

Year One
EARTH 121/122 and 121L/122L
CHEM 120/123 and 120L/123L
PHYS 121/122 and 121L/122L
CS 102,
MATH 113A/B
One elective

Year Two
2A
EARTH 231, 235, 260
One elective
2B
EARTH 221, 232, 238
ENGL 210C
One elective

Year Three
3A
EARTH 333, 358, 370, 390
One elective from Physics, Chemistry, Mathematics, Computer Science, Engineering or Geography Remote Sensing
One unrestricted elective
3B
EARTH 236, 355, 368, 458
One elective from Physics, Chemistry, Mathematics, Computer Science, Engineering or Geography Remote Sensing
One Arts elective

Year Four
EARTH 427, 436A/B, 460, 461, 490
Two electives from Physics, Mathematics, Computer Science, or Engineering
An additional three Earth Sciences courses from 300- or 400-level courses

Recommended Electives:
PHYS 246, 252, 253, 256, 259, 352, 353, 364, 365, 369
CS 212, 230, 316
CIV E 375, 376, 472, 473, 480, 486
CH E 574
CHEM 212, 219, 254, 264, 311, 312, 313, 354
GEOG 275, 375, 376

Co-operative Applied Earth Sciences (Geophysics Option)
This Co-op program supplements the core Geology courses with courses from Physics, Math, Computer Science and Engineering. It aims to graduate earth scientists with a strong background in the techniques of quantitative analysis particularly appropriate for geophysical exploration, hydrogeology, mathematical geology, and geotechnical careers.

Required courses in Mathematics and Physics are:
MATH 114 (or MATH 111B); MATH 115A/B; MATH 213A/B; PHYS 121/122 and 121L/122L.

Year One
EARTH 121/122 and 121L/122L
PHYS 121/122 and 121L/122L
CHEM 120/123 and 120L/123L
CS 102
MATH 115A/B, 114 or 111B

Year Two
2A
EARTH 231, 235, 260
MATH 213A
ENGL 210C
One elective from Physics, Chemistry, Mathematics, Computer Science, Engineering or Geography Remote Sensing.
2B
EARTH 221, 232, 238
MATH 213B
MATH 216 or CIV E 222

Year Three
3A
EARTH 333, 358, 370, 390
One elective from Physics, Chemistry, Mathematics, Computer Science, Engineering or Geography Remote Sensing
One unrestricted elective
3B
EARTH 236, 355, 368, 458
One elective from Physics, Chemistry, Mathematics, Computer Science, Engineering or Geography Remote Sensing
One Arts elective

Year Four
EARTH 427, 436A/B, 460, 461, 490
Two electives from Physics, Mathematics, Computer Science, or Engineering
An additional three Earth Sciences courses from 300- or 400-level courses

Recommended Electives:
PHYS 246, 252, 253, 256, 259, 352, 353, 364, 365, 369
CS 212, 230, 316
CIV E 375, 376, 472, 473, 480, 486
CH E 574
CHEM 212, 219, 254, 264, 311, 312, 313, 354
GEOG 275, 375, 376
Co-operative Applied Earth Sciences
(Environmental Hydrogeology Option)

Year One
EARTH 123/126
CHEM 120/123 and 120L/123L
PHYS 121/122 and 121L/122L
MATH 115A/B
CS 102
One elective

Year Two
2A
EARTH 231, 235, 260
CHEM 266 or BIOL 240
CIV E 221 or MATH 210 or MATH 213A
MATH 213B
2B
EARTH 221, 232, 238
CIV E 222 or MATH 215 or MATH 216
One elective

Year Three
3A
EARTH 333, 355, 358, 359, 390
ENGL 210C
One elective
3B
EARTH 458
CHEM 266, CIV E 486,
GEOG 309 or GEOG 356
BIOL 250 or ENV S 200 or ENV S 201
One elective

Year Four
EARTH 342, 436A/B, 438, 440, 456, 459, 490
Four electives

Notes
1. New EARTH courses.
2. Eight electives are prescribed of which two must be from MATH/SCI courses, three from Faculty of Arts courses, and three are unrestricted.
3. If MATH 213A and B are elected, 213A counts as 200-level MATH/SCI/ENG course and 213B as MATH/SCI elective in course groupings.
4. Or other approved Fluid Mechanics course (see program adviser).

HONOURS SCIENCE PROGRAM FOUR (With Specialization in Earth Sciences)
Admission to, and continuance in, Honours Science – Program Four requires an overall cumulative average of 60%, and a cumulative average of 65% in all Earth Sciences courses.

In order to graduate in the Honours Science program, with a specialization in Earth Sciences, the following requirements must be met:
1. Successful completion of 42 one-term courses as indicated on table page 14:30;
2. Failure of more than one course in the field of specialization will result in the requirement to withdraw from the program;
3. No more than 3.0 SCI credits may be applied to the program;
4. Students must have been enrolled full-time in two out of three years, one of which must be either Year Two or Three, and the other must be Year Four. Year Four of the program must be taken at the University of Waterloo;
5. Mandatory courses as listed below.

Year One
Students entering Year One must take a total of ten term courses, which must include:
EARTH 121/122 and 121L/122L
CHEM 120/123 and 120L/123L
PHYS 111/112 and 111L/112L, or BIOL 111/112 or Two 200-level Biology term courses
MATH 113A/B
CS 102

Year Two
Students entering Year Two must take a total of ten term courses, which must include:
EARTH 221, 231, 232, 235, 236, 238
ENGL 210C
Two other Science term courses

Year Three
Students entering Year Three must take a total of 12 term courses, which must include:
Six or eight term courses from: EARTH 260, 331, 332, 333, 336, 342, 345, 355, or 460, 370
Two other Science term courses
Two or one Arts term courses

Year Four
Students entering Year Four must take a total of ten term courses, which must include:
EARTH 427, plus three to five term courses from EARTH 300- or 400-level courses

MINOR IN EARTH SCIENCES
In order to graduate with a Minor in Earth Sciences, the following requirements must be met:
1. Successful completion of 5.0 credits in Earth Sciences, with a cumulative average of 65% in all Earth Sciences courses.
2. The required credits must include:
a) EARTH 121/122 and 121L/122L in Year One;
b) 2.0 credits from: EARTH 221, 231, 232, 235, 236, 238 in Year Two;
c) 1.5 or 1.0 credits from: EARTH 331, 332, 333, 336, 342, 345, 355, 358, 368, 369, 370 in Year Three;
d) 0.5 or 1.0 credits from: EARTH 421, 432, 433, 434, 435, 438, 440, 458, 459, 470 in Year Four.
Physics

The following programs are offered in the Physics department:

- **Honours Major Programs**
  - **Regular:**
    - Honours Physics
    - Honours Physics (Geophysics Option)
    - Honours Chemical Physics (Joint with Chemistry Department)
  - **Co-operative:**
    - Honours Co-operative Applied Physics
    - Honours Co-operative Applied Physics (Geophysics Option)
- **Honours Science Program Five (with specialization in Physics)**
- **Minor in Physics**

**HONOURS MAJOR PROGRAMS - REGULAR**

**Honours Physics**

The Honours Physics program is in the form of a core of required courses, plus appropriate electives. The electives available in the second, third, and fourth years allow students to strengthen complementary areas of interest whether in some specific field in physics or in some other subject area.

Admission to, and continuance in, Honours Physics requires an overall cumulative average of 60% and a 60% Physics average each year. In addition, students must have an average of at least 65% in the core Mathematics and Physics lecture courses in the Year One program in order to be admitted to Year Two.

In order to graduate with an Honours Physics degree, the following requirements must be met:

1. Successful completion of 19.0 lecture credits plus 2.0 physics lab credits.
2. Mandatory courses as listed below.

**Year One**

**Fall:**
- PHYS 121/121L, 123
- MATH 115A or 113A, 111A or 135
  - One elective (0.5)

**Winter:**
- PHYS 122/122L
- MATH 115B or 113B, 111B or 136
  - Two electives (1.0)

**Year Two**

**Fall:**
- PHYS 10, 252/252L, 256/256L
- MATH 213A, 216 or AM 250
  - One elective (0.5)

**Winter:**
- PHYS 10, 234, 253/253L, 203
- MATH 213B
  - One elective (0.5)

**ELECTIVE PROGRAMS**

The "core plus electives" structure of the Honours Physics program allows a great variety of combinations of courses to be taken. By judicious selection of elective courses, students can deepen their knowledge of theoretical or experimental physics, or emphasize particular aspects of the subject, for example solid state physics, astrophysics or biophysics. It is also possible (subject to timetable restrictions) for physics students to use their elective courses to gain expertise in other subjects, for example business administration, computing, electrical engineering or philosophy. The departmental undergraduate advisors are available to assist any student who wishes to build such a coherent elective program.

**Honours Chemical Physics (Joint with Chemistry Department)**

(see page 14:27)

**HONOURS MAJOR PROGRAMS — CO-OPERATIVE**

Applied Physics is an Honours program in the form of a core of required courses, plus appropriate electives. The electives available in the second, third, and fourth years allow students to strengthen complementary areas of interest whether in some specific field in physics or in some other subject area.

Through the Co-operative part of the program Applied Physics students have the opportunity of exposure to practical research and development situations in Government and industry. Work
opportunities, which are available on a competitive basis, are co-ordinated to complement the student's course work and interest where possible. Many work-term experiences, especially in the upper years, provide the student with a deeper insight into the meaning and methods of research as well as an incentive to develop course work. Such experience provides a contribution to the development of a scientist which cannot be learned in lecture courses, and helps prepare an individual to apply a fundamental physics background to the solution of practical problems.

Further information about the Co-operative work terms and the Department of Co-operative Education and Career Services can be found in Chapter 5.

Options
There are two main options in the Co-op Physics program. The first Option is Honours Co-op Applied Physics, for which the "core plus electives" structure allows a great variety of combinations of courses to be taken. Some examples of the possibilities are given above under the heading "Elective Programs". The second Option is in Geophysics. It is offered as a combination of Physics and Earth Science courses with work terms following the scheme of the Co-op Earth Science program, and is detailed separately below.

Honours Co-op Applied Physics
Admission to, and continuance in, Honours Co-op Applied Physics requires an overall cumulative average of 60% and a 60% Physics average in Year One and in each subsequent term. In addition, students must have an average of at least 65% in the core Mathematics and Physics lecture courses in the Year One program in order to be admitted to Year Two.

In order to graduate with an Honours Co-op Applied Physics degree, the following requirements must be met:
1. Successful completion of 19.0 lecture credits plus 2.0 physics lab credits.
2. Mandatory courses as listed below.

Year One
1A (Fall):
PHYS 121/121L, 123
MATH 115A, 111A or 135
One elective (0.5)

1B Winter or Spring:
PHYS 122/122L
MATH 115B, 111B or 136
Two electives (1.0)

Year Two
2A (Fall):
PHYS 10, 252/252L, 256/256L
MATH 213A or 230A, 216 or AM 250
One elective (0.5)

2B (Spring):
PHYS 10, 234, 253/253L, 263
MATH 213B or 230B
One elective (0.5)

Year Three
3A (Spring):
PHYS 10, 334, 358, 360A, 364
Electives totalling at least 0.75 credits.

3B (Winter):
PHYS 10, 355, 359 365
Two electives (1.0)
One elective 300-level Physics lab (0.25)

Year Four
Students entering Year Four must take a total of 5.0 credits, which must include the following:
4A & B (Fall & Winter):
PHYS 10, 434, 435*, 441, plus an additional 1.0 credit of Physics electives. PHYS 437A and PHYS 454 are strongly recommended for students intending to do graduate work. For those planning to do graduate work in Theoretical Physics, at least two from PHYS 444, 463, 464, 465 and 475 are recommended.

* Students specializing in Astrophysics or Biophysics may substitute an appropriate course in one of these areas for the PHYS 435 requirement, by permission of the Undergraduate Officer.

Honours Co-op Applied Physics (Geophysics Option)
Admission to, and continuance in, Honours Co-op Applied Physics (Geophysics Option) requires an overall cumulative average of 60% and a 60% Physics average in Year One and in each subsequent term.

In order to graduate with an Honours Co-op Applied Physics (Geophysics Option) degree, the following requirements must be met:
1. Successful completion of 19.5 lecture credits, plus 2.0 physics lab credits.
2. Mandatory courses as listed below.

Year One
1A (Fall):
PHYS 121/121L, 123
CHEM 120/120L
EARTH 121/121L
MATH 115A

1B Winter or Spring:
PHYS 122/122L
EARTH 122/122L
MATH 115B, 111B or 136
One elective (0.5)

Year Two
2A (Fall):
PHYS 10, 252/252L, 256/256L
MATH 213A or 230A, 216 or AM 250
One elective (0.5)

2A (Fall):
PHYS 10, 252/252L
MATH 213A, 216
EARTH 231, 260
Science
Physics
Psychology

Winter:
PHYS 122/122L
MATH 115B or 113B, 111B or 136
Two electives (1.0)

Year Two
Fall:
PHYS 10, 222, 224L, 226
MATH 213A, 216
One elective (0.5)

Winter:
PHYS 10, 223, 225L, 246, 259/259L
MATH 213B
One elective (0.5)

Year Three
Fall:
PHYS 326, 358, 360A
One elective Physics lab (0.25)
One Physics elective from list below * (0.5)
One elective (0.5)

Winter:
PHYS 355
Two Physics electives from list below * (1.0)
Two electives (1.0)

* PHYS 275, 375, 380 or 480, 381 or 481, 368, 369.

Year Four
Ten one-term courses (5.0 credits) including at least four one-term courses (2.0 credits) from PHYS 300- or 400-level courses.

MINOR IN PHYSICS
In order to obtain a Minor in Physics, the following requirements must be met:
1. Successful completion of 4.5 Physics lecture credits and 1.0 Physics lab credit, with a minimum average of 60% in all Physics courses attempted;
2. Lecture credits must include: PHYS 121/122 and at least 2.5 other credits from the Physics core;
3. Lecture credits must include at least 1.5 credits from 300- or 400-level Physics courses.

Honours Psychology
The Honours BSc program in Psychology is intended for students who want to apply knowledge gained in biology, chemistry and physics to problems in neuropsychology, neuroscience, cognitive science, developmental and clinical psychology, and related disciplines, or who will seek professional training in medicine perhaps with specialization in neuropsychiatry, psychiatry or pediatrics. A strong background in the natural sciences provides excellent preparation for research or graduate work in these fields of study.
Students interested in Honours Psychology (BSc) will normally be admitted at the beginning of their second year based on their academic performance in Year One, as specified below. Application for admission to Honours Psychology is made at the time of preregistration for Year Two. Normally, only students whose Year One Science average is at least 60% and whose Psychology average is at least 75% will be admitted. Owing to resource limitations, however, fulfillment of the minimum entrance average requirements will not guarantee students admission to Honours Psychology, and a higher Psychology average may be required for admission. In order to remain in good standing in Honours Psychology, students must maintain a cumulative average of at least 60% in the Faculty of Science courses and a cumulative average of at least 75% in the Psychology courses.

Students in Honours Psychology may select either the Thesis Program or the Coursework Program. However, students selecting the Coursework Program are advised that a thesis in Psychology is typically required for admission to graduate studies in Psychology.

Application for admission to the Co-operative Honours program is normally made in November of the second year, with admission interviews taking place before the end of the Fall term. Owing to resource limitations, some students who meet the minimum requirements for continuing in the Honours program may not be admitted to the Co-op program. However, interested students are advised to consult with the Co-op Faculty Advisor when planning their second year programs (see page 9:32 for more details).

In order to graduate with an Honours Psychology degree, the following requirements must be met:

1. Honours Psychology requirements for the Thesis Program (see page 9:31 2a-i) or for the Coursework Program (page 9:31).
2. A total of 5.0 Science credits over Years Two, Three, and Four, including no more than 2.0 SCI credits.
3. Of the above 5.0 Science credits, at least 2.0 must be at the 300- or 400-level, exclusive of SCI credits.
4. A student must have been enrolled full-time in two out of three years, one of which must be either Year Two or Three, and the other must be Year Four. Year Four of the program must be taken at the University of Waterloo.

Recommended Program For the Thesis Program

Year One
Two 200-level term courses in Biology
CHEM 120/123, 120L/123L
PHYS 111/112, 111L/112L or PHYS 121/122, 121L/122L
MATH 113A/B
PSYCH 101, one PSYCH elective

Year Two
PSYCH 291/292 (see overlapping courses page 9:7)
One Natural Science Course from PSYCH 203, 206,
207, 261, 271
One Social Science Course from PSYCH 291/292, 392*, 394, 396, 398
One Social Science Course from PSYCH 392*, 393, 395, 397
One Natural Science Course from PSYCH 203, 206, 207, 261, 271
One Social Science Course from PSYCH 211, 253, 355, 357
One Honours Seminar in Psychology
Four Science Electives (2.0)
Two Unspecified Electives (1.0)

* Students may not use PSYCH 392 to satisfy both 2 and 3.

Year Three
PSYCH 391 (see overlapping courses, page 9:7)
One Natural Science Research Course from PSYCH 392*, 394, 396, 398
One Social Science Research Course from PSYCH 392*, 393, 395, 397
One Natural Science Course from PSYCH 203, 206, 207, 261, 271
One Social Science Course from PSYCH 211, 253, 355, 357
One Honours Seminar in Psychology
Four Science Electives (2.0)
Two Unspecified Electives (1.0)

Recommended Program For the Coursework Program

Students will replace PSYCH 499A/B/C in fourth year with two advanced courses in Psychology and one Psychology elective.

Optometry Program

The School of Optometry of the Faculty of Science offers a four-year professional program leading to the degree of Doctor of Optometry. It is the only School of Optometry in Canada offering a program with English as the language of instruction. The immediate purpose of the program is to qualify individuals for the practice of optometry. Graduates are eligible to apply for registration as optometrists in the province of their choice. The program provides students with a background in general science and specialized knowledge in visual science so that they may follow a career in optometric research and teaching if they so desire. A two-year Diploma of Residency program, designed for persons with the OD degree who wish to improve and extend their clinical skills, is available. Graduate programs in Physiological Optics leading to the Master of Science degree and the Doctor of Philosophy degree are also available.

Students who have completed two years of Honours Science Regular at the University of Waterloo prior to successfully completing the Optometry program may be eligible to transfer 11.0 optometry credits to an Honours Science BSc degree. For details regarding
eligibility, contact the Associate Dean of Science for Undergraduate Affairs.

†As with other health care professions, graduates in optometry must hold the certificate of the licensing body of the province in which they choose to practise.

REQUIREMENTS FOR ADMISSION

Citizenship
Applications are accepted from candidates who are Canadian citizens or from legal residents of Canada who have held Permanent Resident status for at least 12 months prior to the registration day of the Fall term. Proof of Permanent Resident status must accompany the application. In special circumstances a limited number of foreign students (one or two) may be admitted, i.e., those on student authorization.

Prerequisites
Applicants should satisfy the Admissions Committee that they are well-prepared academically for entry to the School of Optometry. A good background in Science and Mathematics is required and the disciplines of Biology/Zoology, Calculus, Chemistry, Physics and Psychology should be represented. At the University of Waterloo a program is offered to allow prospective applicants to the first professional year the opportunity to fulfill all the required and recommended prerequisites courses. The following courses represent the minimum requirements for admission to the School of Optometry: BIOL 230, Cell Biology; BIOL 211, Vertebrate Zoology; CHEM 120/120L, Physical and Chemical Properties of Matter; CHEM 123/123L, Chemical Reactions, Equilibria and Kinetics; PHYS 121/122, 121L/122L, General Physics; (students without OAC Physics must take PHYS 111/112 and PHYS 111L/112L); MATH 113A/B, Calculus; PSYCH 101, Introductory Psychology. The following courses represent a second-year program of strongly recommended courses: BIOL 201, Human Anatomy; BIOL 202, Histology, Embryology; BIOL 240, Fundamentals of Microbiology; CHEM 266/266L, Organic Chemistry; CHEM 237/237L, Biochemistry; PHYS 248/248L, Physical Optics; STAT 202, Statistics. Additional suggestions: One (per term) of any of the following courses: Computer Science, Introductory Accounting, Economics, Languages. Laboratory courses must be completed where given. To complete the pre-professional program, additional courses in the behavioural sciences, social sciences and the humanities are recommended.

Optometry Admission Test (OAT)

THE OAT MUST BE WRITTEN BY ALL APPLICANTS WHO HAVE NEVER SUBMITTED OAT RESULTS TO THE UW SCHOOL OF OPTOMETRY IN PREVIOUS APPLICATION YEARS. Writing the OAT is optional only for repeat applicants who have submitted OAT scores for admission consideration to UW the previous year. Candidates are responsible to ensure that their OAT scores are sent to the UW School of Optometry. ALL inquiries regarding this test should be addressed to:

Optometry Admission Testing Program
211 East Chicago Avenue
Chicago, Illinois, U.S.A. 60611
(312) 440-2693

Only candidates applying for advanced standing in Optometry should contact the Admissions Office of the School of Optometry regarding the OAT requirements.

Selection Factors
All applicants should note that enrolment in the first professional year is limited to 60 and that in 1989 there were approximately 450 applications for those places. Consequently, neither acceptance to nor successful completion of the pre-professional program can guarantee admission to the first professional year. Applicants are selected on a competitive basis considering scholarships, interest, motivation, general qualifications for the profession and recommendations.

While offers of admission are made to well qualified applicants from all the provinces, prospective candidates are advised that some preferential consideration is given to Ontario residents. Applicants to Honours Science, Regular of the University of Waterloo who have completed their secondary school education in provinces other than Ontario should consult with the Science Undergraduate Officer to ensure that their background in Science and Mathematics has prepared them for Honours Science, Regular as given at the University of Waterloo.

The provinces of British Columbia, Alberta, Manitoba, New Brunswick, Prince Edward Island and Saskatchewan have entered into a contract with the University of Waterloo, School of Optometry to offer an allotted number of places to applicants from those provinces. Under the terms of the agreement, the University of Waterloo, School of Optometry offers an allotted number of places in the first professional year to applicants who are residents of contract provinces when such candidates are judged to possess qualifications equal by both academic and non-academic criteria to candidates from other provinces. The breakdown of allotted places for contract province residents is as follows: British Columbia 5; Alberta 7; Saskatchewan 3; Manitoba 3; New Brunswick 1; Prince Edward Island 1 (every 3 years). In each year arrangements will be made to provide an opportunity for applicants from British Columbia, Alberta, Manitoba and Saskatchewan to be interviewed in their home provinces. Applicants from the six contract provinces when such candidates are judged to possess qualifications equal by both academic and non-academic criteria to candidates from other provinces. The breakdown of allotted places for contract province residents is as follows: British Columbia 5; Alberta 7; Saskatchewan 3; Manitoba 3; New Brunswick 1; Prince Edward Island 1 (every 3 years). In each year arrangements will be made to provide an opportunity for applicants from British Columbia, Alberta, Manitoba and Saskatchewan to be interviewed in their home provinces. Applicants from the six contract provinces must meet the same admission criteria as other applicants. Additional information may be obtained from the Admissions Office of the School of Optometry.
Application Procedures
Candidates who are currently or have previously been enrolled in any University of Waterloo course are considered internal applicants. These candidates initiate their application to the Optometry program by completing an application for internal transfer obtained from the Admissions Office at the School of Optometry. The Application for Admission to the School of Optometry, due during pre-registration week in March, can be obtained from the Optometry Admissions Office after October 15. In the Winter term an interview with the Admissions Committee will be arranged for these students. Prospective candidates who have never taken a course at the University of Waterloo are considered external applicants and must apply through the Ontario Universities Application Centre (OUAC). Such applicants should obtain the appropriate OUAC applications form from the Registrar of either the University of Waterloo or any Ontario University. These forms will not ordinarily be available from the Registrar prior to October 15. The Application for Admission to the School of Optometry, due March 31, will be sent by the University of Waterloo Office of the Registrar upon receipt of its copy of the OUAC Form #105 from Guelph, provided that this form is received by February 28. The Application for Admission to the School of Optometry contains seven sections:

Section A: Personal ID
Section B: General Information
Section C: Academic Record
Section D: Autobiographic Sketch
Section E: Personal Health Statement
Section F: 3 Confidential Assessment Forms (CAFs)
Section G: Essay

Specific instructions, including deadlines, will be outlined in the application procedures accompanying the Application.

The deadline for receipt of academic transcripts is June 15. Upon acceptance to the Optometry program students will be requested to submit documentation of up-to-date immunization for measles, rubella, mumps, polio, diphtheria and tetanus (refer to application package for further details). Students are not allowed to participate in the optometry clinics without this documentation.

Students granted admission to the first professional year who have taken courses equivalent to those required in the professional program may apply for exemptions from these courses immediately after acceptance into the program. Details on the policy of exemptions may be obtained by writing to the Admissions Office at the School of Optometry.

Admission to Advanced Standing
Applications are not ordinarily accepted to a year more advanced than the first professional year. However, graduates from certain Commonwealth Universities who are licensed to practise optometry in their country of origin may in certain instances be admitted to a more advanced level in a program leading to the OD degree. For more information write: The Admissions Office, School of Optometry.

Note
Interviews arranged by the Admissions Office of the School are recommended in the following situations before any application will be processed:

1. Applicants with undergraduate or graduate training who have not completed prerequisites for the pre-professional program and who are considering a "make-up" year.
2. Applicants considering a "make-up" year to repeat courses for the purpose of raising grades.
3. Applicants who are engaged at present in another vocation such as teaching, engineering, research, etc., and who may find it necessary to terminate employment before the admission decision has been made.

Appointments for interviews can be made by phone or letter to the Admissions Office of the School of Optometry.

ACADEMIC COURSE REQUIREMENTS
In the Optometry program an overall 60% average as well as a mark of at least 60% in each course of the major subject (including PHYS 246 and BIOL 301 A/B) must be obtained each term. In Optometry 348A/B, 418 and 448A/B a mark of at least 70% will be considered a passing grade. In the Optometry program a student who fails to demonstrate clinical competence as evidenced by a failing grade in a clinical course will not be allowed to continue in the program.

Note
Students entering Year One in Fall 1991 should consult with the Undergraduate Officer about course requirements for years 2-4 of the revised curriculum.

Year One
Fall term:
OPTOM 100, 104, 105, 106, 109
BIOL 301A

Winter term:
OPTOM 111, 114, 115, 149
BIOL 301B

Year Two
Fall term:
OPTOM 241, 242, 244, 245, 246, 251

Winter term:
OPTOM 251, 252, 254, 255, 274

Year Three
Fall term:
OPTOM 342, 344, 346A, 347, 348A, 364

Winter term:
OPTOM 346B, 348B, 350, 351, 352, 353, 357, 372
Year Four

Spring term:
OPTOM 419

Fall term:
OPTOM 440, 442, 448A, 449, 468, 480
OPTOM 441 or PSYCH 357*

Winter term:
OPTOM 448B, 452, 459, 490, 499 (A-E)
OPTOM 451 or one elective (0.5)*

*Students with a particular interest in and an aptitude for research in physiological optics may substitute OPTOM 441/451 for PSYCH 357 and the Winter term elective. A student is required to complete one or the other of these alternatives. STAT 202 or equivalent is recommended for OPTOM 441/451.

COMBINED DOCTOR OF OPTOMETRY – MASTER OF SCIENCE IN PHYSIOLOGICAL OPTICS PROGRAM

Introduction
The School of Optometry offers a combined Doctor of Optometry – Master of Science Program in response to a number of needs among which are:
1. Recognition of outstanding students and their potential contribution to original research and provision of academic enrichment for this.
2. Provision of an introduction to postgraduate study and research for good undergraduate students who might otherwise overlook the opportunity of graduate studies.
3. Graduate training for clinicians.
4. Provision of a quicker route to the MSc for outstanding students.

General Principles of the Combined OD – Master’s Program
A combined Doctor of Optometry – Master’s program is one in which it is deemed academically advantageous to treat the educational process leading through the OD to the MSc degree as a continuous unit, while at the same time satisfying the requirements for both degrees. The combined program also provides the opportunity for mutual enrichment of both programs. The vision science background of the OD program serves as a solid precursor to research at an MSc level. The research at the MSc level broadens the application of the vision science component beyond that of the OD program and provides an increased scientific component to clinical training. This stands in contradistinction to treatment of the Doctor of Optometry and Master’s degree programs, each as terminal activities, starting at the undergraduate level and terminating with the MSc degree in the Faculty of Science, and provides an alternative to the existing undergraduate and graduate programs for the attainment of the MSc degree.

The following are general conditions that all such combined OD – Master’s degree programs satisfy:
1. Students in the combined OD – Master’s program will fulfill the degree requirements of both the OD program and the MSc program. This implies that:
   a) eight terms of full-time registration at the undergraduate level and at least two terms of full-time registration at the graduate level are mandatory;
   b) the graduate program must include at least four (graduate) courses and a thesis.
2. There must be complete freedom of transferability from the combined program to the OD or other undergraduate programs, or to the accelerated PhD program.
3. Admission to the combined program is on the basis of merit, as is continuance in the program. Students who fail to maintain sufficiently high standing will be required to revert to the OD program, or even, if their undergraduate performance so warrants, to withdraw from the University.
4. The culmination of the combined program is the Master’s degree; this will be achieved through the completion of a research thesis and four graduate courses.
5. Entry to a combined OD – Master’s program may occur as early as the term following completion of the first year of the OD program.
6. A combined OD – Master’s degree program must have the flexibility to satisfy the requirements of individual students; at the same time it must have coherence – each student’s program must be addressed toward a well-defined area of specialization in vision sciences.

Structure of the Combined OD – Master’s Program

1. Application and Admission
Admission to the combined OD – Master’s degree program is normally restricted to students with a consistently good academic record at the end of the first year who are granted “conditional admission to the MSc program”. The condition to be fulfilled is “satisfactory completion of the requirements of the OD degree with at least a cumulative B average”.

Students must have all application forms completed and be accepted into the combined program by the beginning of the fourth year. As in any program culminating in a Master’s degree, a faculty supervisor is appointed on admission. Students are encouraged to consult faculty members regarding their research interests.

2. Course Programs
Although the supervisor advises students, all course selections and other academic administrative matters concerning each student are subject to the approval of the department Undergraduate Officer and the Graduate and Research Committee.
The courses chosen by the student (with the advice of the supervisor and approval of the Undergraduate Officer and Graduate and Research Committee) should form a coherent series which (together with the thesis) complete the requirements of the OD and, ultimately, the Master’s degrees.

In third or fourth year, one or two 600-level courses may be chosen for credit to the MSc degree. These courses are in addition to the normal academic program for the OD level. Technically, it is necessary for students to register for these courses as “extras” in order to avoid counting them towards the requirements of both degrees. Students will register in OPTOM 441/451 (Research Project).

A student proceeding to an MSc will normally complete the balance of the four required graduate courses in the one or two terms following fourth year.

3. Summer Research Terms
It is expected that most of the students proceeding to the MSc degree will be involved in Summer research terms following first and second years. During these Summer terms they may register as inactive students and they may be hired as associate researchers for the purposes of various research grants, without the restriction of student salaries. This combination can be attractive from the points of view of available research time, income generation for the student and total research cost from a grant. Work done during these Summer research terms may be included in the thesis. For students entering the OD program prior to Fall, 1991, research work during part of the Summer term following third year is also possible.

During Summer research terms, students may register as active students if they wish to pursue a graduate level course for which they are deemed to have adequate undergraduate preparation. If they register as active students, they may count one of these Summer terms towards their minimum MSc residency requirements.

4. Fourth-Year Projects
For students in the combined OD - Master’s program, OPTOM 441/451 (Research Project) may be integrated with their Summer terms as well as their work following fourth year. The requirements of OPTOM 441/445 must be met. The thesis must contain a substantial research contribution in addition to that submitted for credit in OPTOM 441/451.

5. Granting of Degrees
The OD degree will be granted at the normal time, i.e., at the Spring Convocation following the fourth year. The program, however, culminates in the MSc, which may be granted at the Fall Convocation following the fourth year. It is expected that additional time may be required to complete the thesis or course work. If the student does not register for an active Summer term, the earliest date the MSc degree may be granted is at the Spring Convocation one year after the granting of the OD. Again, additional time may be required to complete the MSc requirements.

6. Postgraduate Scholarships
Students in the combined OD - Master’s program may apply for NSERC, OGS scholarships, etc. at the same time as their colleagues in the regular graduate programs. They are also eligible for Optometry and NSERC undergraduate scholarships during the Summer terms.

7. Withdrawal or Failure
Students may remain in the combined OD - Master’s program provided they maintain sufficiently high academic standards. The minimum is a cumulative B average (73% in undergraduate courses to the end of fourth year, 70% in graduate courses) and no marks below 60.

A student who fails to maintain this standard will be required to withdraw from the combined degree program. In such a case, all courses taken up to the end of fourth year, including those originally intended to fulfill part of the Master’s degree requirements, will be counted towards the OD degree program elective course requirements and these marks included in the fourth year averages as appropriate. Should the student have then satisfied the requirements for the OD degree, it will be granted at the next Convocation. Such students will not be permitted to enter the regular MSc program.

If a student maintains at least the minimum standard mentioned above, but decides to withdraw voluntarily from the combined OD – Master’s program, the fourth year results will be calculated including as above the courses originally intended to fulfill part of the Master’s degree requirements, and if the requirements for the OD degree are then satisfied, the OD will be granted at the next Convocation. Such a student will be allowed (at a later date) to enter the regular MSc program, but the graduate courses taken in the undergraduate terms may not be applied to the Master’s degree.

8. Transfer to the PhD program
Following completion of the OD program and of the minimum MSc residency requirements, a combined OD/MSc student will be eligible for transfer to the PhD program on the same basis as a regular MSc student.
Interdisciplinary Programs

Counselling a student about UW's Interdisciplinary Programs.
Interdisciplinary Study at UW
Modern universities have become highly specialized in their approach to education. There are many historical, academic and professional reasons why this is so, and specialization does have many benefits for students and society. But modern universities still seek to offer students a way to achieve balance and perspective in their studies.

The University of Waterloo provides a challenging way to achieve such balance and perspective by means of its Interdisciplinary Programs. These innovative Programs enhance, complement and support the traditional disciplines while offering the benefits of an interdisciplinary approach to important issues.

The impact of technology on society is one such issue. Thus the Option in Society, Technology and Values (STV) brings together instructors and materials from several disciplines. Similarly Women's Studies makes use of many fields of study, from Anthropology and Economics to Health Studies and Sociology.

Latin American Studies, Peace and Conflict Studies, Legal Studies, Studies in Sexuality, Marriage and the Family — and the rest of the Programs — all follow a similar path, utilizing the knowledge base, faculty members, problem-solving approaches and other resources from numerous disciplines.

Many combinations of Options, Minors, etc. with a student's major field of study are possible and actively encouraged by Program Directors. For example, a student in Honours French may choose a Canadian Studies Option, a student in Honours Biology may decide on a Gerontology Minor, and so on.

By offering a range of Options, Minors and elective courses, UW's Interdisciplinary Programs present an opportunity for students to extend their learning beyond their major field of study. Students in all faculties are invited to register, for example, in an Option or Minor, or to take occasional Interdisciplinary courses for personal interest.

What the Programs Offer
Generally speaking, the Interdisciplinary Programs described in this section of the Calendar offer a General or Honours Option which may be taken in conjunction with regular degree programs in any faculty of the University. Several Programs offer a Minor, a Diploma or a Certificate as well. (See each entry for specific details.) Courses are usually categorized as "Core," "Approved" or "Required."

What the Programs Require
The Programs which have Options typically require six to ten Core, Approved or related courses, all maintained at a stipulated average. To proceed through the Option, students are generally required to:
- select the Option, e.g., International Studies, Middle East Studies, in Year Two;
- choose courses in consultation with the respective Program Director or designated advisor; and
- declare the Option, e.g., Management Studies, Studies in Personality and Religion, on registration documents.

For More Information
In addition to the description presented in this section, many Interdisciplinary Programs provide more details in their own brochure or other publication. For a copy of a Program brochure, or to arrange an interview, contact the respective Director.
Canadian Studies

"To know ourselves" is a primary reason for the existence of the Canadian Studies Program and a perennial motivation for its students. The Program is sponsored by ten departments in the Faculties of Arts and Environmental Studies. Other UW departments also participate.

The Program provides an opportunity to gain insight into Canada in three ways: through courses about Canada in the student's home discipline, through courses about Canada in departments outside that discipline, and through Core interdisciplinary courses offered by Program faculty. The Program office is located at St. Paul's United College on the UW campus.

GENERAL AND HONOURS OPTIONS
Students in Anthropology, Economics, English, Environment and Resource Studies, French, Geography, History, Political Science, Sociology, and Urban and Regional Planning are invited to consider the General or Honours Option in Canadian Studies.

Requirements

Year One
Because most UW students declare their main field of study in their second year, there are no strict Canadian Studies requirements for Year One. However, students intending to take the Option should take a French language course and CDN ST 101 or 102, and they should otherwise proceed with their Faculty's Year One program.

Having chosen a main field of study (a "home discipline") from among the ten departments listed above, students can then select the General Option, for those in a three-year General degree program, or the Honours Option, for those in a four-year Honours program.

Year Two
• CDN ST 201, 202 Core courses
• two term courses in the home discipline dealing specifically with Canada
• two term courses from outside the home discipline, dealing with Canada and chosen from the approved course list (see page 15:4)
• the equivalent of four term courses chosen to meet the Honours requirement in the home discipline

Year Three
• two of CDN ST 301, 302, 310, 313, 365 Core courses
• two term courses in the home discipline dealing specifically with Canada
• two term courses from outside the home discipline, dealing specifically with Canada and chosen from the approved course list (see page 15:4)

General degree students will graduate at the end of Year Three with a degree in their home discipline and with "Canadian Studies Option" shown on the diploma.

Year Four
• CDN ST 400A, 400B Core Courses
• two term courses from outside the home discipline, dealing specifically with Canada and selected from the approved course list on page 15:4
• the equivalent of four term courses chosen to meet the Honours requirement in the home discipline
Double Honours and Canadian Studies
Students may take a joint Honours program and the Canadian Studies Option by taking two term courses in each Honours discipline and the core CDN ST courses. They are not required to take the courses listed outside of their Honours areas in other departments.

MINOR IN CANADIAN STUDIES
Honours students may minor in Canadian Studies regardless of faculty or department. Students taking the Four Year General Degree in Arts may also declare the minor. This requires assembling a package equivalent to ten term courses. The package includes four of CDN ST 101, 102, 201, 202, 301, 302, 310, 313, and 365 plus six term courses from the approved course list below.

GENERAL NON-MAJOR DEGREE (CANADIAN STUDIES)
Students in a General Non-major Degree program at UW can assemble a package of courses emphasizing Canadian Studies.

Requirements
• 30 term courses
• all the subject area requirements listed for the Non-major Degree (it is recommended that at least one term course be taken in French to satisfy the "language other than English" requirement)
• four CDN ST term courses
• eight term courses dealing with Canada and chosen from the approved course list (see below)

This program must be arranged through the Faculty of Arts Undergraduate Office.

PRINCIPAL CANADIAN CONTENT COURSES OFFERED BY PARTICIPATING DEPARTMENTS
The list below indicates courses tentatively scheduled for 1991-92. Refer to previous and forthcoming Undergraduate Calendars for other Canadian content courses.

Anthropology (ANTH)
102 Introduction to Social and Cultural Anthropology
222 Prehistoric Cultures in the Great Lakes Area
230 Indians of Canada
233 Inuit & Eskimo Cultures
241 The Contemporary Canadian Indian Scene
322 Prehistoric Cultures in the Great Lakes Area
499 Honours Essay

Economics (ECON)
101 Introduction to Micro-economics
102 Introduction to Macro-economics
150 An Introduction to Macro and Micro Economics
310 History of Canadian Economic Development
333 Interregional Economics
341 Public Finance
343 Urban Economics

Interdisciplinary Programs
Canadian Studies

345 Industrial Organization
351 Labour Economics
353 Population Economics
355 Economics of Energy and Natural Resources
361 Cost-Benefit Analysis and Project Evaluation
363 Contemporary Canadian Problems

English (ENGL)
205R The Canadian Short Story
214 Themes in Canadian Literature
313 Canadian Literature to 1920
314 Canadian Poetry Since 1920
315 Canadian Prose Since 1920
316 Canadian Drama
490A-Z Special Topics Seminars in Canadian and Commonwealth Literature
495A/B Senior Honours Essay Canadian Literature Option

Environment and Resource Studies (ERS)
241 Introduction to Environmental and Social Impact Studies
338 Social Impact Assessment
352 Current Issues in the Canadian North
385 Technology/Lifestyles for a Conserver Society

Environmental Studies (ENV S)
195 Introduction to Environmental Studies
201 Introduction to Environmental and Planning Law
401 Environmental Law
402 Planning Law
433 People in Natural Areas

French (FR)
151 Basic French
152 Basic French
155 Intensive Review of French
192 French Language
193 French for Bilingual Students 1
250 Advanced French Language
250A Advanced Spoken French 2
273 Aspects du Québec
275 Contemporary French-Canadian Novel
293 French for Bilingual Students 2
300 Advanced French Language
300A Advanced Spoken French 3
371 French-Canadian Poetry
372 Contemporary French-Canadian Theatre
400 Advanced Spoken French 4
400A Advanced French Language

Geography (GEOG)
251 Cities in Canada
300 Geomorphology and the Southern Ontario Environment
303 Geographical Hydrology
322 Geographical Study of Canada
400 Climate and Periglacial Morphology
422 Canada
461 Land Dereliction and Rehabilitation 1
Interdisciplinary Programs

Canadian Studies

History (HIST)

102C Origins of War in the 20th Century
102E Canadian History
204 Life on the Ontario Frontier
206 History of Canadian Minorities
207 Canadian Labour History
215 The Proper Sphere: Canadian Women in Historical Perspective
234 The Catholic Church in Canada since Confederation
248 History of Canadian-American Relations to 1914
253 History of Canadian Indians to 1870's
256 History of Canadian Indians since 1870's
285 Canada From MacDonald to Laurier
389 Canada in World Affairs: From Laurier to Trudeau
403 Senior Seminar: Canadian History

Political Science (PSCI)

101M Introduction to Public Policy
102M Contemporary Issues in Canadian Public Policy
231 Government and Business in Canada
260A/B Canadian Government and Politics 1/2
291 The Canadian Legal Process
292 Issues in Canadian Criminal Law
295 Public Sector Management
331 Public Administration 1
332 Public Administration 2
333 Administrative Law
342 Politics in Quebec
343 Canadian Municipal Government
344 The Politics of Local Government
351 Federal and Consociational Political Systems
363 Canadian Constitutional Law
372 Political Parties and Interest Groups
422 Conflict of Political Ideas in Canada
428 The State and Economic Life
431 Canadian Public Policy
435 The Politics of Canadian Resource Development
442 Politics in Ontario
443 Politics in Western Canada
461 Problems in Canadian Politics 1
462 Problems in Canadian Politics 2

Sociology (SOC)

101 Introduction to Sociology
102 Social Problems
200 Marriage and the Family
204 Sociology of Adolescence
206 Gender Roles
214 Class, Status and Power
221 Canadian Society
222 Juvenile Delinquency
224 Law and Order
226 Juvenile Justice
227 Criminology
228 Sociology of Corrections
232 Technology and Social Change
241 Introduction to the Sociology of Work
242 Industrial Sociology
247 Death and Social Structure
248 Health, Illness and Society
252 Migration and Society
253 Population in Canadian Society
256 Ethnic and Racial Relations
265 Political Sociology
275 The Mennonites as a Sociological Community
280 Environment and Behaviour
333 Canadian Multiculturalism
342 Sociology of Industrial Relations
343 Sociology of Health Care
366 Urban Sociology
377 Studies in the Society of Mennonites
378 Sociology of Women
430 Political Participation

Urban and Regional Planning

PLAN 156 Introduction to Urban and Regional Planning Concepts
PLAN 255 Planning Surveys and Analysis
PLAN 259 Regional Planning and Economic Development
PLAN 322 Canadian Regional Issues
PLAN 330 Urban Social Planning
PLAN 344 Principles of Recreation Planning
PLAN 359 Regional Planning: Program Development and Implementation
PLAN 367 Conservation in Wildland and Resource Management
PLAN 368 Conservation/Resource Management of the Built Environment
PLAN 370 Land Development Planning
PLAN 402 Planning Law
PLAN 414 Issues in Housing
PLAN 430 Social Policy Planning
ENV S 201 Introduction to Environmental and Planning Law
ENV S 417 Land Use History and Landscape Change

PRINCIPAL CANADIAN CONTENT COURSES OFFERED BY OTHER ARTS DEPARTMENTS

Fine Arts (FINE)

219 Canadian Art
316 Canadian Native Art
318 Canadian Ethnic and Traditional Arts

Music (MUSIC)

272 Traditional Folk Music of Canada

Philosophy (PHIL)

215 Business and Professional Ethics
220 Moral Issues
315 Ethics and the Engineering Profession
327A Philosophy of Law: Part 1
Psychology (PSYCH)
212 Educational Psychology
213 Exceptional Children (Consult Department)

Religious Studies (RS)
268B Religious Perspectives in Contemporary Canadian Literature
315 Canadian Native Religions
316 Canadian Native Religious Traditions

Further information
Please contact Dr. W. Klassen, Director, St. Paul's College, 885-1480.

Gerontology

For program description on the Gerontology Minor or Diploma, see pages 8:8 and 8:9.

International Studies

The University of Waterloo is committed to international studies through overseas study programs in a number of departments, through research associations with overseas universities, and through the personal commitments and associations of many faculty members. This Option, approved by Senate in December, 1988, capitalizes on this experience. It will lead students to an understanding of the world's diverse communities and of the cultural and political implications of achieving closer relations. The program is expected to prove useful to those planning a career in the public service or those parts of the private sector which have international interests. It should prove attractive also to those intending to teach in those disciplines in which new curricula are increasing the international component. Further, it will provide a background from which students might apply for admission to graduate programs in international studies.

Requirements
The Option is available to students registered in any Honours or equivalent program in any faculty. It requires completion of ten term courses drawn from an approved list of over 120; four of these should be completed in first and second years from a group of 15. Students are expected to achieve an average of 70% in their international studies courses in order to have the Option recognized on their degree certificate.

Students taking the Option in International Studies are advised to contact the Director at their earliest opportunity, although formal registration in the program may be postponed until, but not later than, entry into third year.

With respect to the total number of courses permitted at any given level, students remain subject to the limitations imposed by the faculty and department in which they are registered.

Interdisciplinary Programs
Canadian Studies; Gerontology
International Studies
Latin American Studies

Curriculum
Four courses must be taken from Group One, of which two must be at the 200-level. Six courses must be taken from Group Two, of which four must be outside the student's major department; four of the six must be at the 300-or 400-level.

Group One - Year One and Two
ECON 231 Introduction to international economics
ERS 231 Environmental issues in a global perspective
GEOG 220B The world region and world issues
HIST 130 The modern world in historical perspective
PACS 250 The nuclear crisis
PSCI 281 International politics
SOC 232 Technology and social change
SOC 256 Ethnic and racial relations
PACS 201* Roots of conflict and violence
PACS 202* Conflict resolution
PSCI 102F* Politics in the third world
PSCI 102K* Mass political violence
PSCI 102N* The Politics of Nationalism and Ethnicity
RS 100A* Religions of the East
RS 100B* Religions of the West

*Students may use only one of these courses in each discipline to meet the requirements of four group One courses

Group Two - Years Three and Four
The list includes courses in Anthropology, Economics, Environment and Resource Studies, Environmental Studies, Geography, History, Middle East Studies, Peace and Conflict Studies, Political Science, Philosophy, Urban and Regional Planning, Religious Studies, Russian, Science and Sociology.

Further Information
Further information may be obtained from the Director, Prof. John English, Department of History, HH, Extension 3771.

Latin American Studies

The Latin American Studies Option is an interdisciplinary program designed for students in any faculty of the University who have an interest in Latin America and the Caribbean. The courses listed below are taught by instructors with research in the area or by those whose interests are in or moving towards that direction. The Latin American content may be total or partial depending on the discipline and instructor. All courses are regular 0.5 credit courses and count towards fulfillment of requirements for graduation.
Requirements
Students must complete ten term courses from those listed below, of which at least six term courses must be selected from disciplines other than the student’s Honours program. To graduate with the Latin American Studies Option indicated on the diploma, students must have an overall average of 65% in the Latin American Studies Option courses.

Courses
HIST 102K Conflict in the Caribbean and Central America
HIST 230 Church and Revolution in Latin America
HIST 232 Revolutions in Latin America
PACS 301A Liberation and Nonviolence in Latin America
PACS 302D The Roots of Violence in Central America
PSCI 102F
PSCI 350A
PSCI 350B
PSCI 453
SPAN 217 Latin American Civilization 1 (in English)
SPAN 218 Latin American Civilization 2 (in English)
SPAN 227 Survey of Latin American Literature 1 (in Spanish)
SPAN 228 Survey of Latin American Literature 2 (in Spanish)
SPAN 101 Language
SPAN 102 Language
SPAN 201A Language
SPAN 201B Language
SPAN 251A Language
SPAN 251B Language
SPAN 351A Language
SPAN 351B Language

Further Information
Please contact the Course Director, M. Gutiérrez, ext. 2377.

Legal Studies

Legal Studies is an Interdisciplinary Option focusing on law primarily from a multidisciplinary perspective. Given the centrality of law to most human institutions and values, a great deal of attention has been paid to law by scholars working in a wide variety of disciplines including Accounting, Actuarial Science, Economics, Environmental Studies, History, Philosophy, Political Science, and Sociology. Students are invited to join these scholarly investigations. The liberal arts orientation of this program emphasizes the student's development of broadly based critical and creative intellectual skills, clarity and facility in the communication of ideas, and humane values in this examination of law as a major feature of social life. In this regard it should be noted that Legal Studies is not intended as either a necessary or a sufficient preparation for law school.

The Legal Studies Options is open to students in General or Honours programs.

Requirements
The courses in this option are divided into three sections. The first consists of broadly based courses that are concerned with the nature and character of legal systems, reasoning and concepts; these include courses in the history of law, philosophy of law, sociology of law, and Canadian law. Students are required to take all the courses (four term courses) in this section. In the second section the courses are in general more advanced and concerned with particular aspects of the law. Students must select four term courses from this section. In the third section the courses are less central to the area of legal studies, but serve to bridge the gap between legal studies and particular disciplines. Students will choose two term courses from courses in this section that fit their General or Honours program. Students are strongly urged to consult the Legal Studies Director in making their course selections from Sections Two and Three.

Students must complete ten term courses designated Legal Studies courses from the appropriate sections. An overall average of at least 65% in these courses is necessary to graduate with the Legal Studies Option.

COURSES

Section 1
Students are required to complete successfully all of the following courses:
HIST 210X History of Law
PHIL 327A Philosophy of Law - Part 1
PSCI 292 Aspects of Canadian Law
SOC 370 Sociology of Law

Section 2
Students are required to complete successfully four term courses from the following list. Students in the Faculty of Environmental Studies must take ENV S 201, 401, and PLAN 402 plus one other course in Section 2.

ACC 231 Business Law
ACTSC 458 Insurance Law
ENV S 201 Introduction to Environmental & Planning Law
ENV S 401 Environmental Law
HIST 102M Law and Society in the Middle Ages: 500-1000
HIST 329 History of the Common Law
ISS 350E Family Law and Social Work
PHIL 327B Philosophy of Law - Part 2
PLAN 402 Planning Law
PSCI 291 The Canadian Legal Process
Legal Studies; Liberal Science

Management Studies

Middle East Studies
can be applied to the Middle East Studies Option. Before preregistration each Spring, students should consult with the Director of the Middle East Studies Option and with the department involved to determine which courses will be available during the coming year.

Requirements
1. This option may be taken in combination with any general or honours program.
2. A minimum of eight term courses are required for this Option. These courses are to be distributed as follows:
   a) MES 200 Introduction to the Middle East
   b) One or more term courses from the series MES 302A-D Directed Studies on the Middle East
   c) The remainder of the courses from the list below. If there are more than five courses in this category they must be taken from at least three different disciplines.
3. To meet the graduation requirements a student must maintain a minimum of 65% average overall in the Option.

Middle East Studies Courses
MES 200 Introduction to the Middle East
MES 302A-D Directed Studies on the Middle East
MES 350A-D Travel Seminars in the Middle East

Middle East Content Courses
ANTH 224 Archaeology and Growth of Cultural Complexity
ANTH 321 Studies in Archaeology of Complex Cultures
CLAS 101 Colossus - the Major Figures of Ancient Greece
CLAS 102 Colossus - the Major Figures of Ancient Rome
CLAS 201 Ancient Greek Society
CLAS 202 Ancient Roman Society
CLAS 251 Greek History
CLAS 252 Roman History
CLAS 292 Modern Issues in the Ancient World
CLAS 301 Ancient Myth and Religion 1
CLAS 302 Ancient Myth and Religion 2
CLAS 371 Christianity and the Roman Empire
CLAS 373 The Fall of the Roman Empire
ECON 335 Economic Development
ENGL 202A The Bible and Literature 1
ENGL 202B The Bible and Literature 2
ERS 218 Introduction to Sustainable Environmental & Resource Systems
ERS 231 Environmental Issues in a Global Perspective
ERS 350 Man and Nature
ERS 361 International Communications System and Development
FINE 110 Introduction to World Art 1
FINE 111 Introduction to World Art 2
GEOG 125 Introduction to the Third World
GEOG 220A The World Region
GEOG 220B The World Region and World Issues

HIST 210 History of Law
HIST 235 History of Christianity
HIST 237 Ancient Civilization 1
HIST 259 Modern African History
HIST 304 Medieval Church History
PACS 201 Roots of Conflict and Violence
PACS 202 Conflict Resolution
PACS 230 The Politics of Nonviolence
PHIL 329 War, Peace and Justice
PSCI 281 International Politics
PSCI 282 Foreign Policy
PSCI 437 The Politics of International Resources
RS 100B Religions of the West
RS 100E Biblical Studies 1
RS 100F Biblical Studies 2
RS 205 The Hebrew Prophets
RS 209 The Apostle Paul: Life and Letters
RS 216 Islam
RS 217 Judaism
RS 225 The History and Culture of the Orthodox Church
RS 304 Modern Study of Jesus
RS 306 Intermediate Biblical Hebrew
RS 308 Parables of Jesus
RS 310 The Sacred Book of Islam
RS 318 Islam and Christianity
RS 334 Islamic Theology, Philosophy and Mysticism
SOC 256 Race and Ethnic Relations
SOC 333 Canadian Multiculturalism
SOC 354 World Population Problems
WS 200 Introduction to Women’s Studies

Note:
Other courses not included in this list may be relevant to the Middle East Studies Option. However, before registration to such courses, students should consult with the Director as to the suitability of these courses to fulfill the requirements of the MES Option.

Participating faculty members are listed in Chapter 17.

Further Information
Please contact the Middle East Studies office, Director: Daniel J. Sahas, HH 323 (ext. 3565).

Peace and Conflict Studies
Peace and Conflict Studies (PACS) is an interdisciplinary program of study which may be chosen by students in conjunction with a major in some other department or in a General non-major program. It provides a course of study for those who have a special interest in the causes and conditions of international, intergroup, or interpersonal conflict, and in approaches to conflict resolution or management. PACS is especially appropriate for those considering careers in conflict resolution occupations (e.g. social work, community development, public administration, law and corrections, education, or politics).
The program is administered by Conrad Grebel College in co-operation with participating departments in the University of Waterloo. The participating departments presently include Environment and Resource Studies, Geography, History, Philosophy, Political Science, Psychology, Religious Studies, Social Development Studies, and Sociology.

PROGRAMS
There are four different programs open to students participating in PACS: 1) General Program Option, 2) Honours Option, 3) Honours Minor and 4) Diploma. Successful completion of either of the first two permits the student to add the subtitle (Peace and Conflict Studies) to the name of the degree earned.

All students in the PACS program will take the PACS Core Courses (described in Chapter 16) as well as a specified number of "PACS Content Courses" (listed below). If students are in a major program they must fulfill all the requirements for the major in their own department.

1. The General Degree Option (Peace and Conflict Studies)
The General Degree Option in Peace and Conflict Studies is available to all students in the Faculties of Arts and Environmental Studies. In addition to fulfilling the major (normally including at least ten term courses in the major field) or non-major requirements, the general degree student must meet the following PACS requirements:

   a) PACS 201, 202, 301, and 302.
   b) any six PACS Content Courses (see below).

2. Honours Option (Peace and Conflict Studies)
Students may choose straight or joint honours in any of the participating departments. Students are granted, upon completion of the program, an Honours BA or BES in their subject areas with the subtitle Peace and Conflict Studies.

In addition to fulfilling the degree requirements in the Major department, students must meet the following PACS requirements in their four-year period of study.

   a) PACS Core Courses 201, 202, 301, 302, 499 A/B. (The PACS 499 A/B requirement may be met by the successful completion of any Honours Research Course or its equivalent which fulfills the requirement for an Honours degree in a participating department, if the research is in an approved PACS-related field of inquiry.)
   b) six term courses chosen from among the PACS Content Courses offered by the student’s department (eight term courses if joint honours in two participating departments). These courses may also be used to meet the department’s honours requirements if approved as such by the department.
   c) three term courses chosen from among any of the PACS Content Courses. (Students should use their first year to take lower-level prerequisites for PACS Content Courses in those departments where they have special interests.)

3. Honours Minor in Peace and Conflict Studies
A Minor in PACS is available to students pursuing an Honours degree in any faculty (including non-Arts faculties). The Minor consists of ten term courses chosen from among the courses approved for PACS credit in any department, and must include PACS 201, 202, 301, and 302.

4. Diploma in Peace and Conflict Studies
This program is especially designed for full or part-time students who wish to explore issues of peace and conflict but who are not necessarily seeking a university degree or already hold such a degree. Requirements are the same as the General Degree Option: 4 PACS Core Courses and six PACS Content Courses. The cumulative average in these courses must be at least 65%.

Peace and Conflict Studies Core Courses

PEACE AND CONFLICT STUDIES CONTENT COURSES OFFERED BY PARTICIPATING DEPARTMENTS

The following PACS-related courses are offered by the participating departments and the PACS program under their own designations. Many of the 300- and 400-level courses have specific prerequisites. Students planning to pursue study in these upper level courses should use their electives wisely to ensure that the prerequisites for these courses are met. Additions or deletions may occur from time to time. Full course descriptions are found in Chapter 16.

Where a participating department has not designated a large enough number of courses to meet the requirements for the Honours Option in PACS, or where students find the list inadequate for their needs, students are encouraged to take the listed PACS Content Courses and/or to petition the PACS Administration to have specific courses accepted as PACS Content Courses. This should happen before registration in the course in question is finalized. Please consult the undergraduate officer for more information.
### Interdisciplinary Programs

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#### History

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<td>RS 257 The Thought and Practice of Christian Peacemaking</td>
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<td>PACS 250 The Nuclear Crisis</td>
<td>RS 263 Justice, Peace and Development</td>
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<td>PACS 390 Field Studies in Peace and Conflict</td>
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<td>PHIL 327A Philosophy of Law 1</td>
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SOC 222 Juvenile Delinquency
SOC 236 Social Movements
SOC 245 Interpersonal Communication
SOC 256 Ethnic and Racial Relations
SOC 265 Political Sociology
SOC 310 Seminar in Group Dynamics
SOC 333 Canadian Multiculturalism
SOC 342 Sociology of Industrial Relations
SOC 364 Social Change
SOC 370 Sociology of Law
SOC 378 Sociology of Women

Recommended PACS-Related Courses
The courses below, offered by non-participating departments, are recommended as of special interest to PACS students.
MES 200 Introduction to the Middle East
PLAN 325 Special Topics in Development of the Third World
SY DE 433 Conflict Analysis

Participating faculty members are listed in Chapter 17.

Further Information
Please contact the Director, R.J.R. Mathies, Conrad Grebel College, 885-0220.

Personnel Studies (formerly Personnel and Administrative Studies)

Personnel Studies is a Minor program that can be taken in conjunction with many existing Honours Majors. The program is designed to provide exposure to those academic disciplines which provide the theoretical background for current management practice. The program should be of interest to those students who wish to pursue further education in management, or to those who plan to begin a management or personnel career at the entry-level immediately after university.

This Minor program assumes that students will develop, in depth, an interest in a major academic field or course of study and then focus this interest by pursuing Personnel Studies. The Minor may be combined with a co-operative program in order to obtain work experience in this field.

Students in the Arts Applied Studies Co-op Program may complete the requirements of the Personnel Studies Minor and tailor their work terms to this field to add a Personnel Studies Specialization to their Honours degree.

The program of study consists of ten half-course credits that may be completed at any point in the four year term.

Interdisciplinary Programs
Peace and Conflict Studies
Personnel Studies
Society, Technology and Values

Program Requirements:
(Students should check course prerequisites before planning their program.)

A. Required Courses
ACC 121 or 123
M SCI 211 or PSYCH 338
PERST 200 (formerly PAS 200)
PERST 300 (formerly PAS 300)
PHIL 215
PSYCH 339

B. Areas of Competence
Before graduation, all students must demonstrate to the Director competence in university-level computing, report writing and statistics. This can be accomplished through some of the elective courses below, or by submitting other comparable evidence.

C. Elective courses (four to be chosen)
CS 100 or 131
ENGL 210A
ECON 351
M SCI 311 or SOC 340
PSCI 295
PSCI 331
PSCH 253
PSYCH 254
PSYCH 334
PSYCH 392
SOC 342

A course in statistics (available in several departments).

Students may apply to the Director for the addition of other courses.

- All students intending to qualify for this Minor should discuss their choice of elective subjects with the Director before making decisions.
- A maximum of three courses in the major field(s) may be double-counted toward this Minor.
- An overall average of 70% in the ten courses constituting this Minor is required.

Further Information
Please contact Program Director, E.S. Lucy, ext. 4551.

Society, Technology and Values

Rapid development of new technologies in communications, biotechnology, robotics and other fields is paralleled by growing public concern and discussion as well as increasing academic research on the human context of science and technology. How can people guide technology so that it will contribute to human betterment? What values shape, or should shape, the direction and pace of technological change? These and other questions are explored in the STV Option and its component courses.
The Option and courses, which are administered by the UW Centre for Society, Technology and Values, are open to students in all UW faculties. Students whose schedules do not permit taking the entire Option are invited to take individual courses.

The Option comprises six courses. Two of these are required core courses; the remaining four are chosen by the student in consultation with the Option Co-ordinator to form a Theme Package. Theme package courses are normally taken after STV 100.

Requirements
Core courses:
STV 100 Society, Technology and Values: Introduction
STV 400 Society, Technology and Values: Senior Project
Four Theme Package courses

Sample Theme Areas
Currently identified Theme Areas are listed below.

Values and Ethics
Issues in War and Peace
Technological Innovation and the Future
Impact Assessment Studies
Economic and Management Issues
Technology and Artistic Expression

Students may propose other Theme Areas in consultation with the Option Co-ordinator.

Sample Theme Package
The following are examples of courses which a student might choose to complete the Technological Innovation and the Future Package:
SOC 232 Technology and Social Change
SY DE 446 Technological Innovation and its Management
ERS 218 Introduction to Sustainable Environment
FINE 352 The Cinema of Science Fiction

Further Information
Please contact the Centre for Society, Technology and Values, MC 4049, ext. 6215.

Option Co-ordinator: Dr. D. Huron
Director: Dr. G.F. Atkinson

Interdisciplinary Programs
Society, Technology and Values
Soviet and East European Studies

The inception of an Interdisciplinary Option in Soviet and East European Studies. Through a wide selection of courses whose primary focus includes Russia, the Soviet Union, and the countries of Eastern Europe, this Option integrates the study of history, politics, geography, economics, and culture, together with language and literature, in a coherent area studies program designed for the undergraduate student. In addition to formal coursework, students in the Soviet and East European Studies Option benefit from a variety of conferences, symposia, workshops and special lectures sponsored annually by the Waterloo-Laurier Centre for Soviet Studies. There are also travel possibilities and fully accredited study abroad opportunities offered by participating departments.

A university background in Soviet and East European Studies can provide the student with a useful basis for a career in government service in Canada and abroad. In addition, the continuing expansion of East-West economic and trade relations has increased the demand for specialists in the business and financial sectors. At the secondary school level, a new emphasis on regional studies and international relations has made a knowledge of the Soviet Union and Eastern Europe an asset for university graduates who choose to enter the teaching profession. Finally, a familiarization with an important and rapidly changing part of our world acquired at the undergraduate level will not only provide for a better understanding of future developments but will also constitute a basis for more specialized professional and academic training.

Requirements:
1. This Option may be taken in combination with any General or Honours program.
2. Students must complete a minimum of ten term courses selected from at least three of the following subject areas: (i) History, (ii) Political Science, (iii) Economics and Geography, (iv) Culture, and (v) Language and Literature Studies. Furthermore,
a) no more than five courses counting toward the Option may be from one subject area or have the same course designator, e.g. RUSS, HIST;
b) at least eight of these term courses must be above the First Year level;
c) the course selection should reflect a reasonable balance between the Soviet Union and Eastern Europe.
3. No more than three term courses which are used to fulfill a student's major program may count toward the Option requirement.
4. To meet graduation requirements a student must maintain a minimum overall average of 65% in the courses selected to fulfill the Option.
5. Although students normally enrol in this Option in Year Two, it is highly recommended that a language course in Russian, Ukrainian, Polish, or Croatian be taken in Year One.

Soviet and East European Studies

Since its establishment in early 1989 the Waterloo-Laurier Centre for Soviet Studies has provided a forum for the activities of scholars at the University of Waterloo and Wilfrid Laurier University who specialize in the field of Soviet and East European Studies. A significant dimension of the Centre's academic objectives is the
### APPROVED COURSES

**History**
- HIST 130: The Contemporary World in Historical Perspective
- HIST 208: The Cold War: American-Russian Relations Since 1917
- HIST 355: Russian History to 1900
- HIST 356: 20th-Century Russia
- HIST 402A: Senior Reading Seminar in Russian and Soviet History
- HIST 402B: Senior Research Seminar in Russian and Soviet History

**Political Science**
- PSCI 362A: Soviet Government and Politics 1
- PSCI 362B: Soviet Government and Politics 2
- PSCI 451: Comparative Communist Systems: Eastern Europe
- PSCI 452: Comparative Civil-Military Relations: Soviet Union and Eastern Europe

**Economics and Geography**
- GEOG 204: The Soviet Union
- GEOG 424: The Soviet Union
- ECON 461: Comparative Economic Systems
- ECON 463B: The Political Economy of Socialism

**Culture**
- RUSS 271: Russian Thought and Culture (to 1905)
- RUSS 272: Russian Thought and Culture (1905 to the Present)
- UKRAN 271: Ukrainian Civilization (to 1800)
- UKRAN 272: Ukrainian Civilization (1800 to the Present)
- FINE 351: Central and East European Film
- RUSS 381: Peoples of the Soviet Union 1
- RUSS 381: Peoples of the Soviet Union 2
- CROAT 371: Croatian Culture and Literature

**Language and Literature Studies**

*a) Language Courses:*
- RUSS 101/102: First Year Russian
- RUSS 251/252: Russian Composition and Conversation
- RUSS 351/352: Intermediate Russian
- RUSS 451/452: Advanced Russian
- UKRAN 101/102: Beginners' Ukrainian
- UKRAN 201/202: Intermediate Ukrainian
- POLSH 101/102: First Year Polish
- POLSH 201/202: Intermediate Polish
- CROAT 101/102: Introductory Croatian
- CROAT 201/202: Intermediate Croatian
- CROAT 301/302: Advanced Croatian

*b) Literature Courses:*
- RUSS 261/261: Introduction to Russian Literary Movements
- RUSS 341/342: Russian Drama
- RUSS 361/362: Russian Short Story

**Interdisciplinary Programs**
- Soviet and East European Studies
- Speech Communication
- Studies in the French Language

*RUS 391/392: Great Russian Novels
UKRAN 301: Introduction to Ukrainian Literature
UKRAN 302: 20th Century Ukrainian Literature*

**For further information contact:**
Professor Robert Karpiak
Director, Soviet and East European Studies
Department of Germanic and Slavic Languages and Literatures
Modern Languages Bldg. Room 222
Ext. 3118

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**Speech Communication**

For program description, see page 9:39.

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**Studies in the French Language/Programme d'études en langue française**

This program is designed particularly for graduates of French immersion programs. Studies in the French Language/Programme d'études en langue française provides an opportunity for students in any UW faculty, especially those with significant high school experience in the French language, to extend that experience by taking part of their UW studies in French while majoring in another discipline.

Several UW departments participate in the program by teaching some of their regular course offerings in French. The Department of French also contributes to the program. For 1991-92, courses will be provided by the Departments of French, History, and Psychology.

The program also offers co-op students the opportunity of taking an academic year at the University of Paris for credit towards their UW degree. Students interested in this exchange arrangement do not need to be taking courses taught in French at UW, but they must possess a level of linguistic competence that will ensure they benefit from their year in France.

Studies in the French Language is administered under the auspices of the UW Interdisciplinary Program board.

**Certificat d'études en langue française**

*Level 1:* Four term courses from the approved list, with a 65% average

*Level 2:* Seven term courses from the approved list, with a 65% average.

Students must pass a proficiency test in French before receiving the certificat upon graduation.

**Approved Courses**
- ENV 195; FR 300, 300A, 303, 400, 400A, 403; HIST 102F.
- 263; PHIL 200A; PSYCH 212
Interdisciplinary Programs
Studies in the French Language
Studies in Personality and Religion (SIPAR)

Honours Minor
A minor in SIPAR is available to students pursuing an Honours degree in any Faculty and to students taking the four year General degree in Arts. It consists of ten term courses chosen from among the courses approved for SIPAR credit in any participating department, and must include the SIPAR Core Courses, SIPAR 202P, SIPAR 270, SIPAR 271, SIPAR 302P.

Note:
Each of the participating departments has designated certain course offerings as SIPAR-content courses. Many 300- and 400-level courses have specific prerequisites. Students planning to take these upper-level courses should use their elective courses wisely to ensure that the prerequisites are met.

CORE COURSES
SIPAR 202P 0.5 Psychology of Religion in Historical Perspective
SIPAR 270 0.5 Psychology of Religion
SIPAR 271 0.5 Personality and Religion
SIPAR 302P 0.5 Seminar on Selected Topics in Personality and Religion

COURSES OFFERED BY PARTICIPATING DEPARTMENTS
The study of selected courses offered by participating departments will either broaden the student's comprehension of the field or permit a deeper understanding of some particular aspect of it. The actual combination of courses selected is subject to approval by the SIPAR advisor.

Religious Studies (RS)
370 Dreams in Religious Experience
371 Religion and Suicidal Behaviour
375 Religion and Psychotherapy

Psychology (PSYCH)
101 Introductory Psychology
211 Developmental Psychology
214 Psychology of Adolescence
231 Psychology of Religious Experience
254 Interpersonal Relations
334 Theories in Counselling Psychology
355 Personality Theory
357 Psychopathology

Philosophy (PHIL)
102C Philosophy of Life
201 Love
236 Magic, Mysticism and the Occult
237 Introduction to Philosophy of Religion
470 Phenomenology

Further Information
For general information, contact the Director, Dr. C. Abbott, at St. Jerome's College. For information on the exchange program with the University of Paris, contact the Director or R. Parker in Co-operative Education and Career Services, NH 1201, ext. 3117.

Participating faculty members are listed in Chapter 17.

Studies in Personality and Religion (SIPAR)
Studies in Personality and Religion (SIPAR) is an interdisciplinary program which may be chosen by students in conjunction with a major in any department. It provides a course of study for those who have a special interest in the relationship between religious growth and human development. The SIPAR Option is also appropriate for those considering careers in the ministry or other social service oriented vocations. The program is administered by St. Paul's College in co-operation with an advisory committee representing four UW departments - Philosophy, Psychology, Religious Studies and Sociology.

Core Courses
The core courses provide an introduction to the field and give students a base of knowledge, a familiarity with the subject and an understanding of the concepts involved.

There are four term courses in the core program; Psychology of Religion in Historical Perspective (SIPAR 202P) provides an historical survey of theories on the relationship between personality and religion; Psychology of Religion (SIPAR 270) examines the variety of religious experience from a psychological point of view; Personality and Religion (SIPAR 271) examines personality theory and its relationship to religious development and growth; and Seminar on Selected Topics in Personality and Religion (SIPAR 302P) involves the study of how the disciplines of philosophy, sociology, and religious studies have come to know and understand human behaviour.

OPTIONS
There are two options available: the first is open to students in a General program; the second, to students in an Honours program only.

General Program
A SIPAR Option may be earned by students in a General program majoring in one of the sponsoring disciplines. Courses must include SIPAR 202P, SIPAR 270 and SIPAR 271 plus three other SIPAR designated courses outside the major field. The subtitle "Studies in Personality and Religion" will be designated on the degree. In every case, students must fulfill all the requirements for the Major in their own departments.
Studies in Sexuality, Marriage and the Family (SMF)

Studies in Sexuality, Marriage and the Family is an interdisciplinary program students may choose along with a Major in an undergraduate discipline or with a General Non-Major program.

The SMF program might be of interest to anyone with questions about sexuality, marriage and the family and be particularly relevant to those who intend to pursue, or are currently involved in, a career in health care, social services, counselling, or teaching.

The program is offered within the Faculty of Arts at the University of Waterloo but is administered by the University of St. Jerome's College which is federated with the University of Waterloo. Students may choose the program as an Honours Option, as a Minor or as a General Option.

A Diploma program in Sexuality, Marriage and the Family is available for those who wish to do some focused study in this field, but who are either not seeking a university degree or already holding such a degree.

The Honours Option in Sexuality, Marriage and the Family

This option is intended for students, pursuing any type of Honours degree at UW, who would like to gain specialization in the area of sexuality, marriage and the family.

In addition to fulfilling the requirements for the Honours degree in the home discipline, the Honours Option in SMF requires the successful completion of at least 14 term courses chosen from the Approved List of Sexuality, Marriage and the Family courses. These 14 term courses must include:

a) SMF 201A Introduction to Sexuality and Sex Education 1

and

b) SMF 202A Introduction to Marriage and the Family 1

or

SMF 201B Introduction to Sexuality and Sex Education 2

c) SMF 301A/B Advanced Study of Sexuality and Sex Education 1 and 2

or

SMF 302A/B Advanced Study of Marriage and the Family 1 and 2

d) SMF 303A Introduction to Marriage and Family Therapy 1

e) SMF 402 Independent Study: Special Topics in Sexuality

or

SMF 403 Independent Study: Special Topics in Marriage and the Family

A cumulative average of at least 75% must be maintained in these seven SMF courses.

Upon completion of the requirements of the Honours degree in their home discipline, and of those of the Honours Option in SMF, students are granted a Bachelor's degree in their subject area with the subtitle: Studies in Sexuality, Marriage and the Family.

The Minor in Sexuality, Marriage and the Family

A Minor in Sexuality, Marriage and the Family is available to students pursuing any type of Honours degree at UW (including a four-year Major program in Arts) who would like some specialization in this field of study. The requirements for the Minor consist of the successful completion of at least ten term courses chosen from the Approved List of Sexuality, Marriage and the Family Courses. The ten term courses must include:

a) SMF 201A Introduction to Sexuality and Sex Education 1

and

SMF 202A Introduction to Marriage and the Family 1

b) SMF 201B Introduction to Sexuality and Sex Education 2

or

SMF 202B Introduction to Marriage and the Family 2

c) SMF 301A Advanced Study of Sexuality and Sex Education 1

or

SMF 302A Advanced Study of Marriage and the Family 1

d) SMF 303A Introduction to Marriage and Family Therapy 1

A cumulative average of at least 70% must be obtained in these five SMF courses.

Upon completion of the requirements of the Honours degree in their home discipline, or of the General degree in a four-year program in Arts, and of those of the Minor in SMF, students are granted a Bachelor's degree in their subject area with the subtitle: Studies in Sexuality, Marriage and the Family.
The General Option
The General Option in SMF is available to students pursuing a General degree in any undergraduate discipline or a Non-major Arts degree at UW. The requirements for the General Option are the same as those for the Minor program in Sexuality, Marriage and the Family, except that the cumulative average in the five SMF courses must be at least 65%.

Upon completion of the requirements of the General degree in their home discipline (or of a Non-major Arts degree), and of those of the General Option in SMF, students are granted a Bachelor's degree in their subject area with the subtitle: Studies in Sexuality, Marriage and the Family.

The UW Diploma in Sexuality, Marriage and the Family
The program is intended for part-time students who seek education in this field but who do not wish to obtain an undergraduate degree or already hold such a degree. Requirements are the same as those for the General Option in SMF; that is, successful completion of ten courses from the Approved List of Sexuality, Marriage and the Family courses. Five of these ten courses must be the SMF courses specified for the Minor in SMF, and the cumulative average in these courses must be at least 65%.

The SMF courses required for the Diploma will be offered regularly during the evening; a number of the other courses on the Approved List of Courses may be offered during the evening as well.

Approved List of Sexuality, Marriage and the Family Courses
ANTH 350  Culture and Sexuality
ENGL 108E  Women in Literature
ENGL 208E  Women Writers of the 20th Century
HIST 202  The Individual and the Family in History
HIST 241  Society and the Sexes in Early Modern Europe
HLTH 220  Health and the Family
ISS 350H  Values and the Contemporary Family
PHIL 201  Love
PHIL 202  Philosophy of Women and Men
PHIL 318J  Philosophy of the Family
PSYCH 235  Psychological Perspectives on Gender and Sex
PSYCH 236  A Psychological Analysis of Human Sexuality
PSYCH 254  Interpersonal Relations
RS 236  Human Sexuality and Christian Morality
RS 382  Theology of Marriage
SOC 200  Sociology of the Family
SOC 206  Gender Roles
SOC 209  Family Origin and Personal Identity
SOCWK 321R  Social Work with Families
one of
SOCWK 355R  Child Maltreatment
SOCWK 357R  Family Violence
SOCWK 390A  Family Violence: Advanced Seminar
SOCWK 390B  Family Violence: Advanced Seminar

Women's Studies
Women's Studies at the University of Waterloo (UW) and Wilfrid Laurier University (WLU) reflects a new understanding of the study of "humankind," the study of women and men with a special focus on gender-based experiences.

Our programs offer opportunities for study at the undergraduate and graduate levels, a Joint Option and Diploma at the undergraduate level, and advanced, theoretical courses at the graduate level. At both levels, we explore such topics as the construction of femininity; social expectations for women; medical, philosophical and religious assumptions about female capabilities; women's self-perception; biological functions and sexual struggles; questions of gender identity; and women's achievements in the arts, literature and science. As well we sponsor activities and speakers relevant to women's lives and studies.

As women are increasingly working outside the home, our WS course offerings can help to prepare students, in a very practical way, for careers in such areas as law, medicine, personnel work, business, teaching and research, politics, volunteerism, social policy and planning, child care, and fine arts.

We invite both women and men to join us in a quest to discover the bountiful history, culture and accomplishments of women.

JOINT OPTION
The Women's Studies Option may be taken in combination with any General or Honours program at either university.

Courses at either university can be used to fulfill requirements. If a course at one university is substantially the same as a course at the other university, credit is given for only one course. Such courses are identified in the lists below.
Students normally enter the Option program in second year. Appropriate courses taken in first year can be counted toward the Option.

**Required Courses**
- WS 200 Introduction to Women's Studies
- WS 300 Seminar in Women's Studies

**Core Courses**
- Three of:
  - ENGL 108E (UW) Women in Literature
  - or English 225 (WLU) The Woman Writer: Theory and Practice
  - HIST 215 (UW) The Proper Sphere: Canadian Women in Historical Perspective
- History 248 (WLU) History of the Sexes
- PHIL 202 (UW) Philosophy of Women and Men
- PSYCH 235 (UW) Scientific Perspectives on Gender and Sex
- SOC 206 (UW) Gender Roles
- Sociology 233 (WLU) Sociology of Women

**Approved Courses**
Three from the "Approved Courses List" (see page 15:18). In exceptional cases, a course from the approved list may be substituted for a core course. Check with the WS Director/Co-ordinator on your home campus. Check also for "Special Topics" courses that may be available.

**DIPLOMA**
This program is designed for students who wish to explore women's issues but are not seeking a degree, and for those already with a degree who want to upgrade their understanding of the dynamics of gender in social institutions, the workplace, government policy, and cultural and normative values.

Especially relevant for students interested in the health care, teaching or counselling professions, in social work, or in personnel and management fields.

**Requirements**
Same as for Joint Option (see above).

Students without a university degree must achieve a 65% average in WS 200 and 300 to continue.

Students with a university degree will be admitted and registered as post-degree students.

**REGISTRATION (All programs)**
Indicate "Women's Studies Option," or "Women's Studies Diploma" on the registration form at your home university, and fill out a "Women's Studies Registration Form" available from the Women's Studies Office at UW. Check with the WS Director/Co-ordinator about which courses are offered in a particular term and make your selection.

Declare the WS Option (or Diploma) as early as possible to ensure that you will have enough academic terms in which to fulfill requirements and that you will receive the appropriate WS designation on your graduation documents.

**Approved Courses List**

**University of Waterloo**
- ANTH 350 Sex Roles in Anthropology
- ANTH 404 Human Development in a Cross-Cultural Perspective
- CLAS 292 Modern Issues in the Ancient World (=WLU Classics 218)
- ECON 353 Population Economics
- ENGL 108E Women in Literature (=WLU English 225)
- ENGL 208E Women Writers of the 20th Century
- FR 391 History of the Sexes
- GEOG 475E Women and Development
- HLTH 220 Alternatives in the Third World
- HIST 221 Health and the Family
- HIST 241 History and the Sexes in Early Modern Europe
- HIST 242 Democracy for All: American Women in Historical Perspective
- ISS/SOCWK 350H Values and the Contemporary Family
- MUSIC 221 Women and Music
- PHIL 201 Love
- PHIL 202 Philosophy of Women and Men
- PHIL 220 Moral Issues
- PHIL 302 Modern Feminism
- PSCI 476 Research Seminar in Political Behaviour
- PSYCH 235 Scientific Perspectives on Gender and Sex
- PSYCH 236 A Psychological Analysis of Human Sexuality
- RS 236 Human Sexuality and Christian Morality
- RS 261 Women and the Great Religions
- RS 292A/B Women and the Church
- SMF 202A/B Introduction to Marriage and the Family 1 and 2
- SMF 302A/B Advanced Study of Marriage and the Family 1 and 2
- SOC 378 Sociology of Women (=WLU Sociology 233)
- SOC 401 Theoretical Perspectives on Gender
- W S 365 A-D Special Topics in Women's Studies
- W S 475 A-D Directed Readings in Women's Studies

(The above courses are described fully in Chapter 16.)
### Wilfrid Laurier University

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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<tr>
<td>Anthropology 317</td>
<td>Psychological Anthropology</td>
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<tr>
<td>Classics 205</td>
<td>Greek and Roman Mythology</td>
</tr>
<tr>
<td>Classics 218</td>
<td>Women in Greece and Rome (equivalent to UW CLAS 292)</td>
</tr>
<tr>
<td>English 225</td>
<td>The Woman Writer: Theory and Practice (equivalent to UW ENGL 108E)</td>
</tr>
<tr>
<td>English 226</td>
<td>Women in Fiction</td>
</tr>
<tr>
<td>Fine Arts 310-3</td>
<td>Images of Women in Art</td>
</tr>
<tr>
<td>Fine Art 311</td>
<td>Women as Artists</td>
</tr>
<tr>
<td>History 248</td>
<td>History of the Sexes up to the Industrial Revolution</td>
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<td>History 249</td>
<td>History of the Sexes from the Industrial Revolution</td>
</tr>
<tr>
<td>Philosophy 249</td>
<td>Consciousness and Gender</td>
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<tr>
<td>Religion and Culture 103</td>
<td>Love and Its Myths</td>
</tr>
<tr>
<td>Religion and Culture 104</td>
<td>Evil and Its Symbols</td>
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<tr>
<td>Religion and Culture 346</td>
<td>Religion and the Crises of Everyday Life: Wisdom Literature in the Old Testament</td>
</tr>
<tr>
<td>Religion and Culture 348</td>
<td>Psychology and Religion</td>
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<td>Social Welfare 201</td>
<td>Income Security in Canada</td>
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<td>Social Welfare 202</td>
<td>Social Services in Canada</td>
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<td>Sociology 201</td>
<td>Sociology of the Family</td>
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<td>Sociology 233</td>
<td>Sociology of Women (=UW SOC 378)</td>
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<tr>
<td>Sociology 234</td>
<td>Sociology of Sex Roles (=UW SOC 206)</td>
</tr>
<tr>
<td>Sociology 403</td>
<td>Feminist Theory</td>
</tr>
<tr>
<td>Spanish 320/370</td>
<td>Women and Spanish-American Literature</td>
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<tr>
<td>Special Topics</td>
<td>To be announced</td>
</tr>
</tbody>
</table>

### Special Topics Courses

Currently over 20 courses in ten subject areas comprise this list. Titles include Human Development in Cross-Cultural Perspective, Women in Greece and Rome, Women Artists, History of the Sexes from the Industrial Revolution to the Present, Love and its Myths, Canadian Social Welfare Programs, and Sociology of Women. Consult the Director before pre-registering.

### Other Women's Studies Content Courses

(These courses are not available for credit toward the Women's Studies Option.)

- CS 402: The Social Implications of Computers
- DANCE 110: Introduction to Dance
- DANCE 233: A History of Modern Dance
- ECON 351: Labour Economics
- ENGL 211: The Novel 1
- ENGL 212: The Novel 2
- ENGL 316: Canadian Drama
- ENGL 335: Creative Writing
- ERS 241: Introduction to Environmental and Social Impact Assessment
- FINE 255R: Film as Social Criticism
- FINE 316: Canadian Native Art
- FR 273: Aspects of Quebec
- HIST 213X: Modern Western Popular Culture
- HIST 254X: Canadian History: The National Period
- ITAL 396: Special Topics/Directed Readings
- PSCI 272: Political Behaviour 2
- PSCI 344: The Politics of Local Government
- PSCI 475: Political Socialization
- PSYCH 214: Psychology of Adolescence
- PSYCH 253: Social Psychology
- PSYCH 311: Behaviour and Development of Human Infants
- RS 256: Current Ethical Issues
- SCI 252: Biology and Society
- SOC 243: Occupational Sociology

### Further Information

Please contact M. Davies, Director, PAS 3017, ext. 2880 or M. Clare, Administrative Assistant, PAS 3023, ext. 6886.
Changing classes in the vicinity of the Biology greenhouses, Physics and the Dana Porter Library.
Course Description Information

Each course description begins with a line of coding as shown in the sample below. The course numbers are prefixed by a course or subject abbreviation. The terms offered, number of hours per week, type of instruction and "credit weight" are displayed. For some courses, information concerning terms offered and type of instruction was not available at the time of publication.

Course description information in the Undergraduate Calendar is accurate as to intention at the time of publication. However, actual course content and the hours/type of instruction may vary somewhat from the listings in the Calendar. Furthermore, circumstances may warrant changes to the term(s) when courses are made available.

To be assured of complete information for preregistration, students must consult the University Course Offerings List for the appropriate term, and any other information distributed by their Department/Faculty, as well as the Calendar, before arranging their programs of study.

The University reserves the right to require a student to withdraw from a course or courses for academic or other reasons.

The Senate and Board of Governors of the University of Waterloo reserve the right to invoke changes in this Calendar without prior notice.

Sample Course Description

<table>
<thead>
<tr>
<th>Course</th>
<th>Term(s) Offered</th>
<th>Type of instruction and number of hours/wk</th>
<th>Credit weight (See Note 1, below)</th>
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<td>STAT 333</td>
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Course Name — Applied Probability

Course Description


Additional — Prereq: STAT 230, and third-year standing

Terminology

Terms Offered

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<tr>
<td>F</td>
<td>Fall term</td>
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<tr>
<td>S</td>
<td>Spring term (See Note 2, below)</td>
</tr>
<tr>
<td>W</td>
<td>Winter term</td>
</tr>
<tr>
<td>J</td>
<td>Summer, first half, July</td>
</tr>
<tr>
<td>A</td>
<td>Summer, second half, August</td>
</tr>
<tr>
<td>M</td>
<td>Summer, both terms, July, August</td>
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Type of Instruction

<table>
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<th>Type of Instruction</th>
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<td>T</td>
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<tr>
<td>S</td>
<td>seminar</td>
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<td>D</td>
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<td>P</td>
<td>practicum</td>
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</table>

Additional Information

prereq prerequisite*  coreq corequisite*  antireq antirequisite*

*Refer to Glossary of Terms (page 7) for details.

Note 1

For term courses with credit weights other than 0.5, students should consult their Faculty Advisor regarding how such courses are counted for degree credits in their particular program.

Note 2

For purposes of course selection, courses designated "S" (Spring) in the Course Description listings are normally those offered in the Spring term of the year following the Fall and Winter terms of the particular academic year.
## Course Abbreviations

<table>
<thead>
<tr>
<th>Course Name</th>
<th>Course Abbreviation</th>
<th>Course Name</th>
<th>Course Abbreviation</th>
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<td>Optometry</td>
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<td>HLTH</td>
<td>Women’s Studies</td>
<td>WS</td>
</tr>
</tbody>
</table>
Accounting

Undergraduate Officer
G. Russell, HH 290, ext. 6516

Introductory Notes

1. Honours Accountancy Studies courses are restricted to students who require those courses as part of their undergraduate program. If space permits, students in good standing in other Honours programs may be admitted, subject to prerequisite requirements.

2. Students who fail to preregister during normal preregistration periods may be unable to take a particular course in their term of preference.

3. The minimum grade required to satisfy a prerequisite for Honours Accountancy Studies courses is C-

4. Students may only repeat courses labelled ACC in which they have a grade of D+ or less. A passed course may be repeated once with the approval of the School of Accountancy.

5. Students may not take both ACC 101 and ACC 121 or ACC 280 and ACC 122 for credit.

6. Registration in ACC 121, 122, 131, 132 and 231 is unrestricted. Preference will be given to students who require these courses as part of their program. The C- requirement indicated in Note 3, above, does not apply to these courses.

ACC 101 F 3C,1T 0.5 Introductory Accounting
An introduction to the principles and practices underlying the historical-cost income determination model. Restricted to students with no accounting OAC.

ACC 121 F,S 3C,1T 0.5 Understanding and Using Financial Accounting Information
This course is designed for non-accounting majors to help them understand and analyze financial statements.

ACC 122 W,S 3C,1T 0.5 Understanding and Using Managerial Accounting Information
This course is designed for non-accounting majors. The use of accounting information to assist in planning, control and managerial decision-making will be examined.
Prereq: ACC 121

ACC 123 W 3C 0.5 Accounting Information for Managers
This course is designed for non-accountants who will use accounting information for planning, control and decision making.
This course cannot be taken if credit has already been received for ACC 121 or ACC 122. Similarly, if credit has been received for ACC 123, then ACC 121 and/or ACC 122 cannot be taken.

ACC 131/132 F,W,S,W,S 3C 0.5 Management I/2
The functional areas of business: finance, personnel administration, production, marketing and accounting are examined within differing organizational structures. Coverage also includes study of the principles of effective management and the financial system in Canada as a source of corporate capital.
Prereq: ACC 131 is a prerequisite for ACC 132

ACC 231 F,S 3C 0.5 Business Law
Particular attention is given to the law relating to contracts and business organizations. Other areas of study include sources of law, the judicial process, real and personal property, taxes, agency, credit, and negotiable instruments.

ACC 241 F,S 3C 0.5 Accounting Information Systems I
Investigates the concepts and principles of management information systems. Concentration is on the role of accounting information in the planning/decision-making process and the design and implementation of accounting information systems.
Prereq: CS 100 or equivalent.

ACC 251 W,S 3C 0.5 Auditing I
An examination of the principles of attestation, including elements of effective control structures, concept of evidence, ethical conduct, legal and statutory requirements and elements of audit strategy.

ACC 280 W 3C 0.5 Introduction to Managerial Accounting
An introduction to the principles and practices of Managerial Accounting. The course is designed for students in the Management Accounting stream and consists of an introduction to the emerging developments in business that affect the management accountant.
The course is a blend of lectures, videos, readings and cases.
Prereq: Accounting OAC or ACC 101
Restricted to students enrolled in Management Accounting Studies.

ACC 281 F,S 3C 0.5 Cost Management Systems
An introduction to the principles and practices of managerial accounting.
Prereq: ACC 101 and second-year standing
Last offering will be Fall '91

ACC 291 F,S 3C,1T 0.5 Financial Accounting
A first course in intermediate financial accounting dealing with the theory and practice of financial statement preparation and reporting. The emphasis will be on asset valuation and the related impact on income measurement.
Prereq: Accounting OAC or ACC 101

ACC 351 F,W 3C 0.5 Auditing II
An examination of the auditing process, including elements of effective control structures, concepts of evidence, ethical conduct, legal and statutory requirements and elements of audit strategy.
Prereq: ACC 291
Last offering will be Winter '93.

ACC 371 F,W 3C 0.5 Managerial Finance
Analytic techniques for financial decision-making will be considered within a conceptual framework. Emphasis is placed upon the long-term investment, capital structure and distribution decisions. Developments in capital asset pricing, and efficient markets will be examined.
Prereq: ECON 221 and ACC 291 or permission of School of Accountancy

ACC 372 W,S 3C 0.5 Managerial Finance II
The theoretical concepts examined in Accounting 371 will be applied within the context of the Canadian economy. Topics examined will include interest rate determination, capital markets, and risk-return characteristics of financing alternatives.
Prereq: ACC 371
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Type</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
</table>
| ACC 381 W.S | 3C   | 0.5     | Cost Management Systems 2  
The development of accounting information in performing the managerial functions of planning, controlling, and decision making. Emphasis is on analysis of costs and analytical tools such as regression analysis, electronic worksheets and linear programming.  
Prereq: ACC 291 and a course in Statistics |
| ACC 382 W.S | 3C   | 0.5     | Cost Management Systems 3  
Consideration of more complex topics in management planning and control. Emphasis is on cost accumulation systems, performance evaluation, control models and case analysis of situations involving complex management accounting systems.  
Prereq: ACC 381 |
| ACC 432 F.W | 3C   | 0.5     | Financial Accounting 2  
This course completes the coverage of intermediate financial accounting. It deals with problems related to the measurement of liabilities, measurement of income, and the reporting and measuring of corporate equities.  
Prereq: ACC 291 |
| ACC 401 W   | 3C   | 0.5     | Accounting Theory  
A review of accounting theory as a background for applying underlying concepts to current accounting problems. Emphasis is on current literature, with a major term paper required.  
Prereq: ACC 392 and 371 |
| ACC 415-419 |      | 0.5     | Special Topics  
Admission by consent of instructor. |
| ACC 432 W   | 0.5  |          | Communicating Accounting Information for Decision Making  
The first half stresses interpersonal communications and covers such topics as communications in the workplace and negotiating skills. The second half concerns formal presentation skills with emphasis on those skills that are necessary for the professional accountant.  
This course is part of an integrated, professionally accredited sequence of courses open only to students by permission of the School of Accountancy. |
| ACC 441 S   | 3C   | 0.5     | Accounting Information Systems 1  
Investigates the concepts and principles of management information systems. Concentration is on the role of accounting information in the planning/decision-making process and the design and implementation of accounting information systems.  
Prereq: CS 100 or equivalent, and ACC 381  
Last offering will be Spring'93. |
| ACC 442 S   | 3C   | 0.5     | Accounting Information Systems 2  
This course investigates the strategic uses of information systems for achieving organizational objectives.  
Prereq: ACC 241 |
| ACC 443 W   | 3C   | 0.5     | Creative Thinking, Problem Solving and Decision Making for Accountants  
This course comprises three modules: problem solving techniques, including intuitive and formal methods for considering risk, uncertainty and value, individual and group processes for generating and evaluating alternatives; data organization, analysis and presentation; and decision support and expert systems.  
Prereq: CS 100 or equivalent  
This course is part of an integrated, professionally accredited sequence of courses open only to students by permission of the School of Accountancy.  
PHIL 443 may be substituted for ACC 443; only one may be taken for credit. |
| ACC 445 S   | 3C   | 0.5     | Auditing 2: Audit Strategy  
An examination of elements of audit strategy and their interrelationships, including financial assertions, types and sources of audit assurance, and evidence gathering procedures, including statistical auditing methods, such as sampling and regression analysis.  
This course is part of an integrated, professionally accredited sequence of courses open only to students by permission of the School of Accountancy. |
| ACC 453 F   | 3C   | 0.5     | Control and Audit of Computer-Based Systems  
An examination of the weaknesses in computer-based systems and compensating controls and their effect on the auditor's study and evaluation of internal control, and the utilization of computer-assisted audit techniques.  
Prereq: ACC 441 |
| ACC 454 F   | 3C   | 0.5     | Comprehensive/Operational Auditing  
Examination of the value for money audit concept in the private and public sectors. This approach goes beyond the scope of the traditional financial audit and looks at all facets of the organization, including human resource management  
Prereq: ACC 351 and fourth-year students in an Honours accounting program |
| ACC 461 F.W | 3C   | 0.5     | Taxation 1  
A course in the interpretation in application of the major provisions of the Income Tax Act through an analysis of court decisions, Revenue Canada's publications, and practical problem situations.  
Prereq: ACC 392 |
| ACC 462 F.W | 3C   | 0.5     | Taxation 2  
A continuation of ACC 461.  
Prereq: ACC 461 |
| ACC 463 F.W | 3C   | 0.5     | Taxation 3  
A course which integrates the topics covered in ACC 461 and 462 for individual and corporate tax planning through a study of trusts, partnerships, corporate reorganizations and estate planning.  
Prereq: ACC 462  
This course is part of an integrated, professionally accredited sequence of courses open only to students by permission of School of Accountancy. |
| ACC 471 W   | 3C   | 0.5     | Investments  
The objective of this course is to introduce the student to concepts of investment selection, purchase and management. The student should obtain a knowledge of security markets and the risk-return characteristics of forms of investment.  
Prereq: ACC 371 |
Actuarial Science

Undergraduate Officers
K.P. Sharp, M.C. 6016, ext. 4492
W.H. Atkken, M.C. 6016, ext. 4471

Courses not offered in the current academic year are listed at the end of this section.

Introductory Note
More detailed course descriptions and course outlines are available in the Actuarial Science Undergraduate Handbook.

ACTSC 231 F,W,S 3C 0.5
Mathematics of Finance
The theory of rates of interest and discount including the theoretical continuous case of rates of interest and discount. Annuities and sinking funds, including the continuous case. Practical and theoretical applications primarily to mortgages and bonds. Yield rates.
Prereq: MATH 137 or 113A and second-year standing
Antireq: ACTSC 221

ACTSC 232 F,W,S 3C 0.5
Introduction to Actuarial Mathematics
The economics of insurance, utility theory. Application of probability to problems of life and death. The determination of single premiums for insurances and annuities in both the discrete and continuous case.
Prereq: ACTSC 231, MTHEL 305A, STAT 230
Antireq: ACTSC 222

ACTSC 331 W,S 3C 0.5
Life Contingencies - Single Lives
Net annual premiums and net level premium reserves. The effect of expenses. The determination of gross premiums, modified reserves, and non-forfeiture options.
Prereq: ACTSC 232

ACTSC 332 F 3C 0.5
Life Contingencies - Multiple Lives
Joint life last survivor probabilities, insurances and annuities. Multiple decrement theory. Stable and stationary populations. Introduction to pension mathematics.
Prereq: ACTSC 232 and ACTSC 331

ACTSC 335 F 3C 0.5
OR Applications in Actuarial Science
Problem formulation and solution techniques in linear programming. Project scheduling with applications in insurance. Introduction to dynamic and integer programming.
Coreq: ACTSC 231, MATH 234A or 235, STAT 230
Antireq: C&O 350, 370

ACTSC 338 W 3C 0.5
Graduation of Life Tables
Theory and methods of data graduation with particular reference to life tables.
Prereq: ACTSC 232

ACTSC 363 F 3C 0.5
Topics in Casualty Insurance 1
Topics in casualty insurance chosen from areas such as coverages, rate-making and underwriting.
Prereq: ACTSC 231

ACTSC 431 F,S 3C 0.5
Risk Theory
Prereq: STAT 333

ACTSC 432 F,S 3C 0.5
Loss Distributions and Credibility Theory
Methods of estimation for the distribution of the size of a single loss. Mixing and parameter uncertainty. Deductibles and other applications. Credibility theory.
Prereq: STAT 330

ACTSC 433 W 3C 0.5
Analysis of Mortality Data
Methods of analysis to produce rates of mortality and other decrements.
Prereq: ACTSC 232, STAT 330

ACTSC 435 W 3C 0.5
Introduction to Demographic Statistics
Topics in demography with emphasis on population projections, mortality theories, and construction of life tables.
Prereq: ACTSC 232

ACTSC 451 W 3C 0.5
Selection of Risks 1
The effects of medical and non-medical risk factors on bodily systems are explored to determine the amount and incidence of additional morbidity and mortality. Techniques for expressing the increased risk in premiums are investigated.
Coreq: MTHEL 305B and third year standing

ACTSC 453 F,S 3C 0.5
Basic Pension Mathematics
Theory and practice of pension plan funding. Assumptions, basic actuarial functions and population theory applied to private pensions. Concepts of normal costs, supplemental liability, unfunded liability arising from individual accrued benefit and projected benefit cost methods.
Prereq: ACTSC 232

ACTSC 454 W 3C 0.5
Pension Funding
Group and other generalized cost methods for pension plans. Effects of early retirements, plan design and actuarial assumptions on pension costs. Cost forecasts applied to private and public pension plans - in particular to the CPP.
Prereq: ACTSC 433

ACTSC 455 W 3C 0.5
Analysis of Financial Statements
Topics of insurance financial reporting including assets, liabilities, surplus, amortization of gains, the Policy Premium method of actuarial reserves, investment and currency reserves, and the analysis of gains and losses.
Prereq: ACTSC 331

COURSES NOT OFFERED 1991-92

ACTSC 221 Mathematics of Investment
ACTSC 222 Contingencies
ACTSC 223 Group Life and Health Insurance
ACTSC 337 Finite Differences
ACTSC 391 Topics in Actuarial Mathematics
ACTSC 441 Advanced Topics in Actuarial Mathematics
ACTSC 452 Selection of Risks 2
ACTSC 456 Taxation of Life Insurance
ACTSC 458 Insurance Law
ACTSC 464 Topics in Casualty Insurance 2
ACTSC 491 Seminar in Actuarial Mathematics 1
ACTSC 492 Seminar in Actuarial Science 2
Anthropology

Undergraduate Officer
T.S. Atler, PAS 2009, ext. 3044

Courses not offered in the current academic year are listed at the end of this section.

ANTH 101 F,W 3C 0.5
Human and Cultural Evolution
An overview of Physical Anthropology and Archaeology. Lectures on living and fossil primates, the fossil evidence for the origins and development of man, modern races, and archaeological evidence for the origins and development of culture.

ANTH 102 F,W 3C 0.5
Introduction to Social and Cultural Anthropology
The dynamic nature of socio-cultural systems is examined. Topics include language, technology, social organization, economics, politics, and religion. Data are drawn from a broad ethnographic base, including both “primitive” cultures and modern, developed societies.

ANTH 201 F 3C,1L 0.5
Principles of Archaeology
An introduction to the working assumptions, analytic approaches, and integrative and descriptive methods of archaeological anthropology.

ANTH 202 W 3C 0.5
Principles of Social Organization
An introduction to basic concepts used by social anthropologists for the analysis of social, economic, political and ideological systems.
    Prereq: ANTH 102 or permission of the instructor

ANTH 203 3C 0.5
North American Prehistory
This is a general introduction to North American Archaeology. The traditional cultural ecological approach is used.

ANTH 210 W 3C 0.5
Anthropology Through Science Fiction
Basic anthropological concepts, such as biological and cultural evolution, culture, human adaptability, and culture contact will be explored through examples from science fiction and related anthropological studies.

ANTH 222 3C 0.5
Prehistoric Cultures of the Great Lakes Area - A Survey
A general survey of the archaeological evidence for prehistoric cultures in the Great Lakes area from their arrival ca. 11,000 years ago to the coming of the Europeans. Cultural ecology and cultural evolution will be stressed.
    Prereq: ANTH 102 or permission of the instructor

ANTH 224 W 3C 0.5
Archaeology and Growth of Cultural Complexity
Archaeological approaches to cultural complexity are examined, using New and Old World examples. Topics considered may include: agricultural origins, megaliths, chiefdoms, states and the emergence of cities, and early civilizations. Regional emphasis may vary.

ANTH 230 W 3C 0.5
Indians of Canada
The cultures of Canadian Indians are described as they existed when initially contacted by Europeans. Consideration is given to economic adaptation, social organization, political structure, material culture, ritual, and mythology.
    Prereq: Second-year standing

ANTH 233 F 3C 0.5
Inuit and Eskimo Cultures
An examination of Inuit and Eskimo cultures of Alaska, Canada, and Greenland from their prehistoric origins to the present. Administrative systems imposed upon the Inuit and Eskimo will be analysed and compared, as will the contemporary problems these communities face.
    Prereq: Second-year standing

ANTH 241 F 3C 0.5
The Contemporary Canadian Indian Scene
An analysis of present-day Canadian Indian politics, economics, social organization, and education. The emergence of pan-Indianism and large-scale Indian organizations will be examined as responses to the Federal Government's policy of withdrawing and decentralizing administrative services for native people.

ANTH 260 F 3C,1L 0.5
Human Evolution
Data methods and theory in the study of the origin and evolution of humans are surveyed. Topics will include genetic theory, primate evolution, human fossils and modern human adaption.
    Prereq: ANTH 101 or permission of the instructor

ANTH 261 W 3C 0.5
Primate Behaviour
An introduction to the behaviour of non-human primates and its relevance to human development. Topics will include social organization, role behaviour, and communication patterns, as well as the history of primate studies.

ANTH 300 F 3C 0.5
Design of Anthropological Inquiry
This course systematically examines research design and methodology in anthropology.
    Prereq: ANTH 202

ANTH 311 F 3C 0.5
Magic, Witchcraft and Religion
An introduction to the way in which anthropologists study the system of behaviour and belief known as religion.

ANTH 322 3C 0.5
Prehistoric Cultures of the Great Lakes Area
An in depth study of the archaeological evidence for prehistoric cultures in the Great Lakes area from their arrival ca. 11,000 years ago to the coming of Europeans. Cultural ecology and cultural evolution will be stressed.
    Prereq: ANTH 203 or consent of the instructor

ANTH 330 3C 0.5
Cultural Ecology
An examination of the relationships among environment, technology, society, and culture. The increasing levels of complexity will be considered in the context of hunting and foraging bands, horticultural tribes and chiefdoms, pastoral tribes and agricultural peasants.
    Prereq: Full credit in Anthropology or consent of the instructor
ANTH 351 W 3C 0.5
Comparative Policies on Native Minorities
A comparative survey of government policies on native minorities with emphasis on recent attempts to involve native groups in the policy-making processes. The course will compare policy approaches to Canadian Indians and Metis, Australian Aboriginals, New Zealand Maoris and Scandinavian Samis (Lapps).
Prereq: ANTH 351 or permission of the instructor.

ANTH 352 F 3C 0.5
History of Anthropological Thought
An examination of the historical origins and development of culture theory. The major emphasis is on the period from the appearance of anthropology as a distinct discipline in the nineteenth century until the emergence of modern perspectives in the 1950s.
Prereq: ANTH 102 or permission of the instructor.

ANTH 365 W 2C,1L 0.5
Fossil Hominids
A detailed examination of the fossil evidence for human evolution with particular emphasis on interpretation and reconstruction.
Prereq: ANTH 260 or permission of the instructor.

ANTH 390A/B F,W 0.5/0.5
Reading in Anthropology
Guided reading in a selected portion of the anthropological literature.
Prereq: Anthropology Major or Honours student and permission of the instructor.

ANTH 492/F,W 0.5/0.5
Directed reading and research in a selected area of anthropology inquiry.
Prereq: ANTH 499A will be submitted only after the completion of ANTH 499B.

COURSES NOT OFFERED 1991-92
ANTH 103 The Nature of Language
ANTH 223 Archaeology and Cultural Adaptation: Gatherers and Hunters
ANTH 228 Peoples of the Pacific
ANTH 270 Archaeological Method and Technique
ANTH 271 Archaeological Field Methods
ANTH 304 Aging and Dying
ANTH 320 Studies in Hunter-Gatherer Archaeology
ANTH 321 Studies in Archaeology of Complex Cultures
ANTH 333 Applied Anthropology
ANTH 345 Special Topics in Anthropology
ANTH 350 Culture and Sexuality
ANTH 370 Ethnographic Field Methods
ANTH 377 Early Cultures in the New World
ANTH 400 Special Topics in Anthropological Theory
ANTH 460 Human Adaptation and Evolution
ANTH 461 Selected Topics in Primate Behaviour

Course Descriptions
Anthropology
Applied Mathematics

Applied Mathematics
Undergraduate Officer
B.J. Marshman, MC 5176, ext. 3762

Courses not offered in the current academic year are listed at the end of this section.

Introductory Note
More detailed course descriptions and course outlines are available in the Applied Mathematics Handbook.

AM 231 F,W 3C,1T 0.5
Calculus 4
Vector integral calculus, including line integrals, Green's theorem, the Divergence theorem, and Stokes' theorem, with applications to physical problems. Introduction to the Calculus of Variations. Sequences and series of functions and their applications, including the role of uniform convergence.
Prereq: MATH 237
Antireq: MATH 210, 212, 213B, 220B, 230B, 240B
Formerly MATH 230B
This course replaces MATH 230B effective Winter, 1991.

AM 250 F,W 3C 0.5
Modelling with Ordinary Differential Equations
Overview of the modelling process. Examples of physical systems leading to ordinary differential equations. Applications to Newton's laws of motion, mechanical vibrations, and population dynamics. The emphasis is on the physical derivation and interpretation of the model equations.
Prereq: MATH 130B or 137
Antireq: MATH 215, 216
Formerly AM 260

AM 251 F,W 3C 0.5
Modelling with Systems of Ordinary Differential Equations
Prereq: MATH 138 or 230A, or consent of instructor
Formerly AM 270
Course Descriptions
Applied Mathematics

AM 331 F.W 3C 0.5
Real Analysis
Topology of $\mathbb{R}^n$, continuity, norms, metrics, completeness. Fourier series and applications, for example, to ordinary differential equations, the heat problem, optimal approximation, the isoperimetric inequality.
Prereq: MATH 230B or 237
Antireq: MATH 322A, PMATH 351
Cross-listed as PMATH 331
Not available for credit to students in Honours Pure Mathematics programs.

AM 332 W.S 3C 0.5
Complex Analysis
Complex numbers; continuity, differentiability, analyticity of functions; the Cauchy-Riemann equations; solution of Laplace's equation; conformal mapping by elementary functions, and applications; contour integration, the Cauchy and allied theorems; Taylor and Laurent expansions, uniform convergence and power series; the residue calculus, and applications.
Prereq: MATH 230B or 237
Antireq: MATH 322A, PMATH 351
Cross-listed as PMATH 332
Formerly MATH 332
Not available for credit to students in Honours Pure Mathematics programs.

AM 333 F.S 3C 0.5
Elementary Differential Geometry and Tensor Analysis
Curves in Euclidean 3-Space ($\mathbb{E}^3$) and their intrinsic geometry. Gaussian curvature and the Gauss-Bonnet theorem. Co-ordinate transformations and tensors in $n$-dimensions; $n$-dimensional Riemannian spaces; covariant differentiation; geodesics; the curvature, Ricci and Einstein tensors. Applications of tensors in Relativity and Continuum Mechanics.
Prereq: AM 231 or MATH 230B, or consent of instructor
Cross-listed as PMATH 365
Formerly AM 362

AM 341 W 0.5
Introduction to Perturbation Theory
Pitfalls in computation; solution of linear algebraic equations, polynomial interpolation; least squares; numerical integration and differentiation. The intent is to expose students to the theory behind modern algorithms for solving mathematical problems.
Prereq: CS 132 or 140, MATH 134B or 136, MATH 235 or (MATH 230B and 234A) is recommended.
Antireq: CS 372, 374
Cross-listed as CS 337

AM 343 W 3C 0.5
Discrete Models In Applied Mathematics
Difference equations, Laplace and z transforms applied to discrete (and continuous) mathematical models taken from ecology, biology, economics and other fields.
Prereq: MATH 230B or 227, or consent of instructor
Formerly AM 340

AM 351 F.S 3C 0.5
Ordinary Differential Equations
Existence and uniqueness theorems; higher order systems of equations, series solutions and special functions. Laplace transforms. Eigenvalues and eigenfunction expansions; applications to mathematical physics. Sturm's comparison, separation and oscillation theorems.
Prereq: MATH 230B or 237. AM 250 is recommended for non-AM majors.
Formerly AM 381

AM 353 F.W.S 3C 0.5
Partial Differential Equations 1
First order partial differential equations and characteristic curves. Second order linear partial differential equations, primarily in two variables: physical origins; classification into hyperbolic, parabolic and elliptic equations; the Cauchy initial value problem and characteristic curves. Derivation and analysis of solutions of the wave equation, heat equation and Laplace's equation, separation of variables and eigenfunction expansions; Fourier integrals; d'Alembert's solution and the propagation of waves; maximum principle for harmonic functions. Introduction to systems of partial differential equations. Hyperbolic systems, reduction to canonical form.
Prereq: AM 231 and AM 251, or AM 251 and MATH 230B, or consent of instructor
Coreq: AM 351
Formerly AM 371

AM 361 W 3C 0.5
Continuum Mechanics
Prereq: AM 231 or MATH 230B, or consent of instructor
Coreq: AM 353 and AM/PMATH 332 (or PMATH 352)
Formerly AM 365

AM 371C F.S 3C 0.5
Classical Mechanics
Prereq: AM 231 or MATH 230B, or consent of instructor
Formerly AM 395

AM 373 W 3C 0.5
Quantum Mechanics 1
Critical experiments and old quantum theory. Basic concepts of quantum mechanics: observables, wavefunctions, Hamiltonians and the Schrödinger equation. Uncertainty, correspondence and super-position principles. Simple applications to finite and extended one-dimensional systems, harmonic oscillators, rigid rotor and hydrogen atom.
Prereq: AM 371C or consent of instructor
Formerly AM 465A

AM 375 W 3C 0.5
Special Relativity and Electromagnetic Field Theory
Prereq: AM 333 and AM 371C, or consent of instructor
Formerly AM 364
AM 381 C F,S 3C 0.5
Introduction to Information Theory
Prereq: Consent of instructor
Cross-listed as PMATH 380A
Formerly AM 380A

AM 431 F 3C 0.5
Measure and Integration
Lebesgue measure and integral for the real line, general measure and integration theory, convergence theorems, Fubini's theorem, absolute continuity, Radon-Nikodym theorem, $L^p$-spaces.
Prereq: AM/PMATH 331 or PMATH 351
Cross-listed as PMATH 451 or AM 462

AM 432 W 3C 0.5
Functional Analysis
Banach spaces, linear operators, geometry of Hilbert spaces, Hahn-Banach theorem, open mapping theorem, compact operators, applications.
Prereq: AM 431/PMATH 451 or PMATH 353
Cross-listed as PMATH 453
Formerly AM 472

AM 433 F 3C 0.5
Differential Geometry
Some global aspects of surface theory, the Euler-Poincaré characteristic, the global interpretation of Gaussian curvature via the Gauss-Bonnet formula. Submanifolds of $E^n$, induced Riemannian metrics, extrinsic and intrinsic curvatures, Gaussian-Codazzi equations. Local Lie groups of transformations on $R^n$, infinitesimal generators, the Lie derivative. An introduction to differentiable manifolds, the tangent and cotangent bundles, affine connections and the Riemann curvature tensor. The above topics will be illustrated by applications to continuum mechanics and mathematical physics.
Prereq: AM 333/PMATH 365 or consent of instructor
Cross-listed as PMATH 445
Formerly AM 474

AM 435 W 3C 0.5
Applications of Algebra
A survey of undergraduate mathematics with emphasis on the unifying effect of algebraic concepts. This is a cross-disciplinary course; theorems of modern algebra are related to topics chosen mainly from advanced calculus and differential geometry.
Prereq: MATH 234B or PMATH 336
Formerly AM 444

AM 441 F 3C 0.5
Numerical Solution of Differential and Integral Equations
Prereq: CS 374, or CS 337 and consent of instructor, CS 372 is recommended.
Cross-listed as CS 476

AM 451 W 3C 0.5
Introduction to Dynamical Systems
Prereq: AM 351 or consent of instructor
Formerly AM 391

AM 453 F 3C 0.5
Partial Differential Equations 2
A thorough discussion of the class of 2nd order linear partial differential equations with constant coefficients, in two independent variables. Laplace's equation, the wave equation and the heat equation in higher dimensions. Theoretical/Qualitative aspects: well-posed problems, maximum principles for elliptic and parabolic equations, continuous dependence results, uniqueness results (including consideration of unbounded domains), domain of dependence for hyperbolic equations. Solution procedures: elliptic equations - Green's functions, conformal mapping; hyperbolic equations - generalized D’Alembert solution, spherical means, method of descent; transform methods - Fourier, multiple Fourier, Laplace, Hankel (for all three types of partial differential equations); Duhamel's method for inhomogeneous hyperbolic and parabolic equations.
Prereq: AM 351 and 353, or consent of instructor
Formerly AM 481A

AM 455 W 3C 0.5
Control Theory
Prereq: Consent of instructor
Formerly AM 488

AM 456 F 3C 0.5
Calculus of Variations
Prereq: AM 231 or MATH 230B, or consent of instructor
Formerly AM 482

AM 463C F 3C 0.5
Fluid Mechanics 1
Fundamental equations of inviscid fluids, compressibility, vorticity; two and three-dimensional irrotational, incompressible flow. Blasius' theorem, Joukowski hypothesis. Water wave motion.
Prereq: AM 341
Formerly AM 486

AM 482
### Course Descriptions

**Applied Mathematics**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>AM 464C</td>
<td>Fluid Mechanics 2</td>
<td>Shock wave theory, supersonic flow around a corner, Prandtl-Meyer flow. Dynamics of real fluids, Navier-Stokes equations, exact solutions, Stokes and Oseen flow; Turbulence, Boundary layer theory. Introduction to Geophysical Fluid Dynamics. Prereq: AM 463C  Formerly AM 476</td>
</tr>
<tr>
<td>AM 465C</td>
<td>Elasticity</td>
<td>Basic equations of elasticity for homogeneous isotropic bodies; bending of beams; plane elastic waves; Rayleigh surface waves, Love waves. Solution of problems by potentials, variational methods and Saint Venant’s principle. Prereq: AM 381; or consent of instructor. Formerly AM 495</td>
</tr>
<tr>
<td>AM 477F</td>
<td>Statistical Mechanics</td>
<td>Equilibrium statistical mechanics is developed from first principles, based on elementary probability theory and quantum theory (classical statistical mechanics is developed later as an appropriate limiting case). Emphasis is placed on the intimate connections between statistical mechanics and thermodynamics. Although it would be useful, prior knowledge of quantum theory is not necessary. Prereq: Consent of instructor. Formerly AM 486</td>
</tr>
<tr>
<td>AM 491F</td>
<td>Topics in Applied Mathematics 1</td>
<td>A selection of special topics given by members of the Applied Mathematics Department. Prereq: Consent of instructor. Formerly AM 469</td>
</tr>
<tr>
<td>AM 492W</td>
<td>Topics in Applied Mathematics 2</td>
<td>A selection of special topics given by members of the Applied Mathematics Department. Prereq: Consent of instructor. Formerly AM 478</td>
</tr>
<tr>
<td>AM 495F</td>
<td>Reading Course</td>
<td>Prereq: Consent of instructor.Formerly AM 489</td>
</tr>
<tr>
<td>AM 496W</td>
<td>Reading Course</td>
<td>Prereq: Consent of instructor. Formerly AM 499</td>
</tr>
</tbody>
</table>

**COURSES NOT OFFERED 1991-92**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM 252</td>
<td>Foundations of Applied Mathematics</td>
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<tr>
<td>AM 493</td>
<td>Applications of Mathematics</td>
<td>[Formerly AM 430]</td>
</tr>
<tr>
<td>AM 494</td>
<td>Applications of Mathematics</td>
<td>[Formerly AM 440]</td>
</tr>
</tbody>
</table>

**Architecture**

Undergraduate Officer
T. Meyer Boake, ES2 272D, ext. 6647

Courses not offered in the current academic year are listed at the end of this section.

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**COURSES FOR BACHELOR OF ENVIRONMENTAL STUDIES (PRE-PROFESSIONAL ARCHITECTURE)**

**ARCH 100 F 3C 0.5**

**Discussions in Architecture**

An introductory course which explores in broad terms the nature of our architecture, what it is composed of, how it has evolved, and ways in which it may be perceived and interpreted. The main streams in the development of modern architecture are traced up to the present and lead to a discussion of current work, ideas and concerns, and the role of the architectural profession.

**ARCH 112 F 4C 0.5**

**Mathematics in Architecture**

The application of mathematics to architecture through evolutionary geometrical studies, humanist thought, perspective development; geometrical constructions; trigonometry; algebra; calculus and matrices.

**ARCH 113 W 2C,2L 0.5**

**Introduction to Computers in Architecture**

This is an introduction to desktop computers as used in architectural practice. Half of the course will focus on 2 and 3-dimensional computer-aided design concepts and skills. Most of the remainder of the course will focus on cost estimating and specifications using data-base, spread sheet and word processing software. All applications will be based on a single case study building which is used throughout the course. Replaces CS 100

**ARCH 124 F 2C,2std 0.5**

**Introduction to Landscape Design**

An introduction to the design of landscape with emphasis upon the architectural attributes of plants and landforms. Replaces ARCH 195
Course Descriptions
Architecture

ARCH 142 F 4C,2L 1.0
Iconography 1: Conventions
Selected schemes of order, such as fate, providence, natural law, the human will, as expressed in plays, poems and fiction from various ages; selected conventions in literature, cinema, and the visual arts; the development of one or two archetypal symbols in literature and the visual arts; directed to lead into more detailed studies of symbolic patterns in Iconography 2.
Prereq: ARCH 142

ARCH 143 W 4C,2L 1.0
Iconography 2: A Survey of the Symbolic Nature of the Environment
A study centred on ancient life to initiate the student into the stream of cultural history and the complex problems of what the artist is, the quality of the human existence, culture, environment, as well as the working of the icon from raw state of perceived image to its function as an expressive symbol in poetry, music, dance, architecture and other works of art; a study of modern work in comparison to an ancient achievement.
Prereq: ARCH 142

ARCH 163 W 1C,2L 0.5
Statics and Structural Analysis
Fundamental concepts of mechanics and structures, as related to architectural design, study of loading conditions, forces, moments, systems of forces, conditions of equilibrium for two and three dimensional structures, centre of gravity of loads and areas, bar forces in trusses, simple frame analysis, friction, moment of inertia.
Prereq: ARCH 112

ARCH 171 F 3C 0.5
Theories and Technologies of Building
Introduction to applications of technology in the design and construction of buildings. Organized as a series of case studies concentrating on the last three centuries, it addresses, among other themes, the emergence of new structural methods and materials, the evolution of environmental control, the rationalization of building assembly, and the invention of the modern urban infrastructure.
Prereq: Consent of instructor

ARCH 172 W 3C 0.5
Building Construction I
An introduction of the fundamentals of building construction, in terms of materials, technical aspects of the making and design of buildings, basic building science and environmental concerns. Emphasis will be placed on soils, foundations, masonry construction and wood frame construction.
Prereq: Consent of instructor

ARCH 174/175 0.5 each
Experimental Courses
These courses offer a vehicle for introducing additional electives to the program on a short-term basis, and for developing future permanent courses.
Prereq: Consent of instructor

ARCH 192 F 1T,1S,14std. 1.5
Design Fundamentals and Workshop Design Studio
Development of the means to appreciate art and science of building; introduction to a history of architecture; introduction to the study of theories of architecture; development of skills in graphic communication; introduction to a study of building structure, construction, and materials; promotion and encouragement of the theory and practice of design. Field trip (1 week).
Prereq: Architecture students only

ARCH 193 W 1T,1S,14std. 1.5
Design Fundamentals and Studio
Reinforcement and development of the ARCH 192 program, but with emphasis upon the application of design method and practice to specific architectural problems.
Prereq: ARCH 192

ARCH 213 F,W 3C,3std 0.5
Introduction to Architectural Computer Graphics
The focus of the course is on three-dimensional modeling using computers. There are two studio projects: the first involves the design and modelling of sculptures; the second deals with interpretations, through modelling, of distinctive buildings from the recent and distant past. Lectures support the hands-on work by providing a general theoretical background.
Prereq: ARCH 113, CS 100, ARCH 192, 193 or consent of instructor

ARCH 225 S 3C 0.5
Patterns of Perception: Landscape and Settlement
In this course, students will be confronted with the ways different professionals with whom the architect has to deal (developer, planner, ecologist, archaeologist, public health official, etc.) look at landscape and settlement. The course will explore the interface of these latter concerns with those of architecture.
Prereq: Consent of instructor: for Architecture 2B students

ARCH 244 F 2C,2D 0.5
History of Gardens of Europe and Western Asia
The study of gardens as works of art reconciling man with his world. Gardens of Europe and Western Asia are studied as responses to specific human needs, the stress and aspirations of an age, and to the climate and landscape of the land in which they were created.
Prereq: Consent of instructor

ARCH 245 W,S 1C,2L 0.5
Survey of Contemporary Architecture
Beginning with the formative years of modern architecture, the course will analyse buildings and theories of representative architects and designers, documenting the development of architectural ideas in Europe and elsewhere.
Prereq: Consent of instructor

ARCH 246 F 4C,2L 1.0
Foundations of Europe: Sense of Periods and Styles
Recognition of patterns of life and concepts of order and conduct, models of the universe and other, moving metaphors and myths by means of study of the thoughts, acts, art, architecture, technology, literature, music and town design of the West from the break-up of the Roman Empire until the Renaissance. Field trips to museums, concerts in Toronto, Detroit or Buffalo.
Prereq: ARCH 143 or consent of instructor
ARCH 247  S  4C,2L  1.0
Renaissance to Revolution: Sense of Periods and Styles
Analysis of the various styles emerging out of provincial and international
Gothic, especially Italian use of classical models, the spread of this "rena-
sance" mode, leading to consideration of the Mannerist, the Baroque, the
Rococo, the Neoclassical; investigation of the course of men's attitudes from
humanism, nationalism, and Reforma-
tion through the Enlightenment until the
French Revolution and Hume's deth-
ronement of Reason. Field trips to
museums, concerts in Toronto,
Quebec, Detroit or Buffalo; Stratford
Festival.
Prereq: ARCH 246 or consent of
instructor

ARCH 252  F,W,S  0.5
Creative Problem Solving
Development of creative skills through
group behaviour in problem solving
sessions: developing a clear under-
standing of each participant's own
creative thought processes; increasing
his/her ability to consciously and delib-
erately make use of his/her own
creative potential; engendering an
awareness of the capacity to use
himself/herself and the people he/she
works with to produce better solutions
to the problems identified by the group.
Prereq: Consent of instructor

ARCH 262  F  2C,2L  0.5
Strength of Materials
Concept of simple stress and strain;
statically indeterminate axially loaded
members; thermal stresses, torsion,
shear and bending moments in simple
beam; shear and moment diagrams,
qualitative deflected shapes, flexural
and shearing stresses, deflection calcu-
lations; combined stresses, beams of
different materials, compression
members, Euler's formula.
Prereq: ARCH 163

ARCH 266  F  3C  0.5
Building Construction II
The study of more advanced aspects of
building construction dealing with the
design and technological aspects of
building structure: reinforced concrete,
precast concrete, and steel framing;
building envelope: cladding principles,
window walls, roofing and glazing; and
interior finish selection and interface
with mechanical and electrical systems.
Prereq: ARCH 172 or consent of
instructor

ARCH 274/275  0.5 each
Experimental Courses
These courses offer a vehicle for intro-
ducing additional electives to the
program on a short-term basis, and for
developing future permanent courses.
Prereq: Consent of instructor

ARCH 276  S  2C,2L  0.5
Timber: Design, Structure and
Construction
Architectural case studies are used to
examine conceptual development,
structural design, building process and
the selection of structural timber
systems. Topics such as flexural,
compression and truss members;
connections; and plywood construction
are studied using calculations, design
aids, rules of thumb and the latest CSA
design standards.
Prereq: ARCH 262

ARCH 284/285  F,W  3C  0.5 each
Architectural Research
This offers a student an opportunity for
independent research into architectural
problems not offered in the regular
curriculum, guided exploration of
specific architectural problem areas, of
appropriate complexity to the particular
term.
Prereq: Approval of (in house) UGAC

ARCH 292  F  3C,11std  1.5
Design Concepts and Studio
To develop in each student the ability to
design on a small, personal scale and
explore design as a thinking process.
Small space design exercises where
the student is required to define and
analyze a problem and generate an
architectural solution. Solutions are
refined through a series of evaluations.
Prereq: ARCH 192, 193

ARCH 293  S  3C,11std  1.5
Design Concepts and Studio
Design involving problems of human
perception and dimension in complex or
large spaces, and to develop in each
student the ability to generate solutions
to architectural problems on a scale
which involves "privacy and commu-
nity". Emphasis is placed on program-
ning, analysis and solution evaluation.
Problems of construction, servicing,
and sited will be further explored. Field
trip to a major Urban Area (1 week).
Prereq: ARCH 292

ARCH 313  W  3C,3std  0.5
Computer Aided Design
The emphasis of the course is on
Computer Aided Design (CAD). Soft-
ware running on personal computers
(AUTOCAD) and on minicomputers
(McDonnell Douglas, GDS) will be
used. These systems will be used to
develop a systematic approach to the
creation of line drawings such as a floor
plan of a distinctive apartment building
and elevations of Baroque or Renais-
sance buildings. The drawing projects
will be supplemented by seminars on
CAD system usage and related theory.
Prereq: ARCH 213

ARCH 345  W  2C,1S  0.5
Architectural Theory 1850-1940
Beginning with the introduction of
important theories of architecture in
vogue prior to 1850, the course will
examine texts, movements, buildings,
projects, and urban proposals of the
period in order to understand the struc-
ture of contemporary architectural
theory.
Prereq: Consent of instructor

ARCH 346  W  2C,2L  0.5
Historicism and Romanticism: Sense
of Periods and Styles
Depiction of "modern" culture as one in
which the notion of environmental order
is replaced by a notion of order as the historical
creation of autonomous wills. Selected
works in philosophy, literature, art and
architecture will be studied.
Prereq: ARCH 247 or consent of
instructor

ARCH 348  F (Rome)  2C,2S  0.5
Italian Renaissance Architecture
Architecture and urban design from the
early 15th to the early 17th century in
central and northern Italy. Special
attention is paid to the development of
theory and its relation to architectural
practice. In addition to the works of the
major figures of the period, typical rela-
tionships between buildings and their
urban and natural contexts are consid-
ered.
Prereq: Registration in ARCH 492 or
consent of instructor
Architectural case studies are used to examine conceptual development, structural design, building process and the selection of structural steel systems. Topics such as tension, flexural and compression members; and connections are studied using calculations, design aids, rules of thumb and the latest CSA design standards.

Prereq: ARCH 262

Concrete: Design, Structure and Construction
Architectural case studies are used to examine conceptual development, structural design, building process and the selection of structural concrete systems. Topics such as flexural (rectangular, T-Beams, and one-way slabs) and compression members; footing and retaining walls; non-reinforced and reinforced masonry walls are studied using calculations, design aids, rules of thumb and the latest CSA design standards.

Prereq: ARCH 262

Building Services I
The course focuses on the air and water systems of buildings and is aimed at developing knowledge and skills appropriate to architectural practice. Subjects covered include environmental parameters, heating and cooling loads, energy conservative design, the selection of heating, ventilating and air conditioning systems, plumbing systems, and fire protection criteria and systems, with reference to building codes and standards.

Coreq: ARCH 302 or consent of instructor

COURSES FOR BACHELOR OF ARCHITECTURE

ARCH 445 F,W 2C,2D 0.5
The Practice of Criticism in Creative Design
The application of critical thought will be exercised regularly through oral and written assignments on a wide range of designed human experience; secondarily, there will be reading assignments to facilitate the practice of criticism through a broadening knowledge of critical theory and its relationship to culture.

Prereq: Consent of instructor

ARCH 446 F (Rome) 2C,2S 0.5
Italian Urban History
The course provides a survey of the history of settlement and urban form on the Italian peninsula from antiquity to the present day. It is the influence upon the structure of public and private space are outlined for each historical period. These include the constants such as geography and climate, but more especially the factors that induce and manifest change: politics, warfare, economics, social structure, the arts and theory.

Prereq: Registration in ARCH 492 or consent of instructor

ARCH 447 S 2C,1S 0.5
Japan: Signatures on the Landscape
The ambitions of the course are to make connections between pre-war and post-war ideologies as a context for looking more closely at the work of contemporary architects and planners in Japan.

Architecture students only OR consent of instructor

ARCH 448 F (Rome) 2C,2S 0.5
Rome and the Campagna
History of settlement and building in Rome and the surrounding area from antiquity to the present. Acts of design in architecture, urban form and landscape related to political, cultural and spiritual authority of Rome. Comparison drawn between the image of the city, represented in literature and art, and the material facts of the place.

Field trips, lecture.

Prereq: Registration in ARCH 492 or consent of instructor
ARCH 451  W 2C,1S  0.25  
The Financial Aspects of  
Architecture  
The course is an introduction to the  
financial aspects of the development  
and construction industries. The  
economics of property development  
and the process of cost estimation and  
control will be treated from a practical  

Prereq: BArch Students or consent of  

instructor  

ARCH 452  W 2C,1S  0.25  
Specifications  
Architectural working drawings and  
specifications; bidding requirements;  
general conditions; general require-  
ments trade divisions; reference and  
source material; assembly and repro-  
duction; structural, mechanical and  
electrical consultants.  

Prereq: BArch Students or consent of  

instructor  

ARCH 453  S 2C,1S  0.25  
Professional Practice  
Discussion of the legal and ethical  
aspects of architectural practice in  
Canada and in Ontario; in particular,  
contracts, bonds and insurance,  
construction lien, by-laws and regula-  
tions, architectural partnership. The  
legal background, client-architect rela-  
tions, partial services, professional  
problems.  

Prereq: BArch Students or consent of  

instructor  

ARCH 454  S 2C,1S  0.25  
Acts and Codes  
The course introduces students to the  
legislative context within which archi-  
tects operate; specifically, The Archi-  
tects' Act, The Planning Act and The  
Building Codes.  

Prereq: BArch Students or consent of  

instructor  

ARCH 474/475  0.5 each  
Experimental Courses  
These courses allow for additional  
electives to the program on a short-  
term basis, and for developing future  
permanent courses.  

Prereq: Consent of instructor  

ARCH 484/485  F,W  3R  0.5 each  
Architectural Research  
This offers a student an opportunity for  
independent research into architectural  
problems not offered in the regular  
curriculum. It allows guided exploration  
of a specific architectural problem area,  
of appropriate complexity to the partic-  
ular term.  

Prereq: Approval of (in house) UGAC  

ARCH 492/493  F,W,S  3C,18std  2.0  
each  
Design Studio  
The intent of these courses is to  
develop skills and gain experience in  
architectural design through the appli-  
cation of design and analysis tech-  
niques to complex building types. This  
is approached through a series of  
design projects aimed at the exploration  
of generative factors in the definition of  
built form. Projects are related to  
eexisting contexts and respond to  
current concerns of architectural theory  
and practice. Both individual and group  
work are included. Fall term held in  
Rome or Waterloo.  

Prereq: ARCH 393 for 492 and 492  
for 493  

ARCH 499  W,S  0.0  
Fifth Year Thesis Proposal  
Architectural students are responsible  
for developing a satisfactory thesis  
proposal prior to and as a pre-requisite  
of the 5A Design Studio. The completion  
of this requirement will be indicated  
as a mark of 'CR for the course on the  
student's academic record. The thesis  
proposal will be developed indepen-  
dently by the student between the 4B  
and 5A terms and will be reviewed and  
assessed by the 5A studio instructor.  

Prereq: ARCH 493  

ARCH 574/575  0.5 each  
Experimental Courses  
These courses allow for additional  
electives to the program on a short-  
term basis, and for developing future  
permanent courses.  

Prereq: Consent of instructor  

ARCH 584/585  W,S  3R  0.5 each  
Architectural Research  
This offers a student an opportunity for  
independent research into architectural  
problems not offered in the regular  
curriculum. It allows guided exploration  
of a specific architectural problem area,  
of appropriate complexity to the partic-  
ular term.  

Prereq: Approval of (in house) UGAC  

ARCH 592/593  W,S  32C  3.0 each  
Design Studio  
These courses provide an opportunity  
for the student to select an area of  
concentration for study and design in  
depth. A thesis topic is to be submitted  
and approved during term eight (4B)  
and all research work completed by the  
end of the eight-month Co-op work term  
five. Terms nine and ten (5A and 5B)  
will be spent developing the thesis for  
presentation during term ten. The thesis  
is to be a vehicle for thinking and  
design at an innovative level. Thus  
considerable emphasis is placed on  
both theory and development of design  
solutions.  

Prereq: ARCH 499 and consent of  

instructor  

A letter grade for ARCH 592 will be  
submitted only after the completion of  
ARCH 593.  

COURSES NOT OFFERED 1991-92  
ARCH 212 Computer Science Simulation  
ARCH 223 Human Ecology: Social  
Behaviour as the Human/Physical  
Interface  
ARCH 282 Preservation Practice-  
Background  
ARCH 283 Preservation Practice-  
Technology and Technique  
ARCH 347 The Roots of Civilization  
ARCH 371 Designing and Building with  
Solar Energy  
ARCH 455 Management and Esti-  
mating  

ARCH 504/505 W,S 3R 0.5 each  
Experimental Courses  
These courses allow for additional  
electives to the program on a short-  
term basis, and for developing future  
permanent courses.  

Prereq: Consent of instructor  

ARCH 594/595 W,S 3R 0.5 each  
Architectural Research  
This offers a student an opportunity for  
independent research into architectural  
problems not offered in the regular  
curriculum. It allows guided exploration  
of a specific architectural problem area,  
of appropriate complexity to the partic-  
ular term.  

Prereq: Approval of (in house) UGAC
Arts

Courses not offered in the current academic year are listed at the end of this section.

Introductory Notes

1. Courses designated "Arts", those listed below, usually cover some topics and themes of general interest to several disciplines and their presentation is often made with this interdisciplinary perspective in view.

2. Arts courses are elective courses in General and Honours programs and, except for ARTS 301, do not satisfy either the Group A or Group B requirements.

ARTS 122 F 0.5
Quest for Meaning in the Twentieth Century
This course invites students to a quest for personal and corporate meaning in the context of a century in which traditional meanings and definitions have been challenged by world wars, nuclear threat and rapidly shifting sexual, social, economic and religious values.

ARTS 225 W 0.5
Mennonite Authors and Artists
An examination of Mennonite cultural expression in literature (fiction, poetry, drama, children's literature) and the visual arts (especially painting and 11thm) during the past century.

ARTS 301 0.5
Studies in the Humanities
A one-term multi-disciplinary study of the humanities, including art and music as well as literature, history and religious studies. In addition to the principal professor, visiting lecturers from the different disciplines enable the student to see each discipline through expert eyes. Also discussion of the nature of the humanities, and their role in life, business, etc.

Prereq: Second-year standing
Counts toward the A(l) requirement
(Formerly ARTS 100)

Biology

Undergraduate Officers
D. Barton, B2-243, ext. 2559
M. Globus, B2-256B, ext. 2506
W.R. Hawthorn, B1-280, ext. 2117
P.E. Morrison, B1-171A, ext. 2557
N. Scott, B2-147C, ext. 6435

BIOL 111 F 2C 0.5
Introductory Biology 1
An introduction to basic concepts in Biology including aspects of cell structure, function, metabolism, reproduction, heredity, and molecular genetics. The biology of viruses and simple organisms will be emphasized.

Open to students other than those intending to major in Biology or to enter the School of Optometry.

BIOL 111 cannot be counted for credit toward a joint degree in Biology and the Faculty of Environmental Studies.

BIOL 112 W 2C 0.5
Introductory Biology 2
An introduction to the basic principles of the structure and function of plants and animals within an ecological and evolutionary framework. The biology of multicellular organisms will be emphasized.

Open to students other than those intending to major in Biology or to enter the School of Optometry.

BIOL 112 cannot be counted for credit toward a joint degree in Biology and the Faculty of Environmental Studies.

BIOL 201 F 2C,3L 0.5
Human Anatomy
Basic anatomical features of the skeletal, muscular, nervous, cardiovascular, endocrine and reproductive systems of the human.

Open to students other than those intending to major in Biology. Required for students enrolled in Honours Science Program Two (Pre-Health-Professions Option), but not open to students in other Biology major programs. Strongly recommended for students intending to enter the School of Optometry.

BIOL 201 cannot be counted for credit toward a BSc (Kinesiology) degree.

Biology

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BIOL 201 cannot be counted for credit toward a BSc (Kinesiology) degree.
BIOL 239 W,S 2C,3L 0.5
Genetics
Offered during the Spring term in even-numbered years.

BIOL 240 F 2C,3L 0.5
Fundamentals of Microbiology
Introduction to fundamental theories, principles and methods of microbiology. Structure, methods of cultivation, growth, effects of physical factors, and inhibition and killing of microorganisms will be studied.

BIOL 241 W,S 2C,3L 0.5
Introduction to the Microbial World
Biological characterization of major bacterial groups, microorganisms as geochemical agents, utilization of microorganisms by man, and mechanisms of microbial pathogenicity.
Offered during the Spring term in odd-numbered years.

BIOL 250 F 3C 0.5
Ecology
An introduction to the study of the relationships of plants and animals to their environment. The nature of ecosystems, ecological energetics, biogeochemical cycling, community ecology, introduction to population biology.
BIOL 298 is recommended for students specializing in ecology.

BIOL 273 W,S 2C,3L 0.5
Introductory Human Physiology
The physiology of the major organ systems including the nervous, muscular, circulatory, respiratory, urinary, digestive, endocrine and reproductive systems.
Antireq: SCI 351-352
Offered during the Spring term in even-numbered years.
(Formerly BIOL 233)

BIOL 298 F 1ld lab 0.25
Field Course 1
A series of one-day field trips from campus held on Saturdays during the first half of term (omitting Thanksgiving weekend), designed to introduce students to the flora, fauna and major ecosystems of Southern Ontario. Written reports will be required for each trip.
Coreq: BIOL 250 or equivalent
Field trip fee of $75 is required towards the cost of transportation.
Minimum enrolment of 24 students is required.

BIOL 301A/B F/W 3C,3L 0.5/0.5
Human Physiology
The physiology of the major organ systems of the body. The topics discussed include circulation, respiration, digestion and nutrition, metabolism, muscle, nervous systems, special senses, and the endocrine system.
No credit or grade will be given for the first term course unless the two term sequence is completed.
For Optometry students only.

BIOL 402 F 2C,3L 0.5
Embryology
Fundamental processes and concepts in embryonic development including the acquisition of multicellularity, organization of the early embryo, morphogenesis of tissues, major organ systems, fetal membranes, growth, differentiation and analysis of common developmental defects.
(Formerly BIOL 300)

BIOL 403 F 2C,3L 0.5
Developmental Biology
Analysis of embryonic development of selected organisms with emphasis on growth and the processes of subcellular, cellular and organ differentiation stressing recent experimental methodology.
(Formerly BIOL 425)

BIOL 404 W 2C,3L 0.5
Histology and Cytology
The structure of mammalian cells, tissues and organs interpreted in functional terms. Cell reproduction and differentiation, with some discussion of the embryological origin of tissues and the regulation of tissue growth. Light and electron microscopy techniques.
Prereq: BIOL 211 or 230 or 273
(Formerly BIOL 333)
Antireq: BIOL 202

BIOL 410 W 2C,3L 0.5
Invertebrate Zoology
The biology of invertebrate animals, excluding arthropods. Topics covered will include reproduction, development, life history, feeding, locomotion, and behaviour. Laboratories will introduce the major invertebrate phyla.
Prereq: BIOL 210
(Formerly BIOL 315)

BIOL 411 W 2C,3L 0.5
Vertebrate Zoology
Major topics in vertebrate zoology as exemplified by both living and fossil members of the phylum Craniata.
Prereq: BIOL 211
(Formerly BIOL 311)

BIOL 412 F,S 2C,3L 0.5
Arthropod Zoology
A survey of the phylum Arthropoda, including the insects, with emphasis on their classification, interrelationships and ways of life.
Prereq: BIOL 210
Offered during the Spring term in even-numbered years.
(Formerly BIOL 316)

BIOL 416 F 2C,3L 0.5
Entomology
Introduction to morphology, systematics and biology of insects. Insect collection is required as part of the course.
Brief field trips will be made to collect insects from different local habitats.

BIOL 420 W 2C,3L 0.5
The Flora of Canada

BIOL 421 F,S 2C,3L 0.5
Plant Anatomy and Morphogenesis
Plant structure in relation to function and development with particular reference to the vascular plants. Cell, tissue and organ differentiation.
Prereq: BIOL 220 and 230
Offered during the Spring term in odd-numbered years.
(Formerly BIOL 323)

BIOL 422 F 2S,3L 0.5
Mycology
Fungal taxonomy and ecology: medical mycology; plant pathology; industrial applications; food and food processing; toxins and hallucinogens; biological control; fungi as coprophiles, predators and symbionts with plants and animals.
Prereq: BIOL 221
(Formerly BIOL 327)
Course Descriptions
Biology

BIOL 423 W 2C,3L 0.5
Plant Physiology
A study of physiological principles that govern the water economy, mineral nutrition, transport processes and metabolism of plants with a strong emphasis on biophysical and biochemical mechanisms.
(Formerly BIOL 335)

BIOL 424 F 3C 0.5
Ferns, Gymnosperms and Fern Allies: an evolutionary survey
A detailed survey of the non-flowering vascular plants with emphasis on the extant members of each major group in Ontario. The phylogeny of the plants will be explored through a study of fossil ancestors in each line of evolution.
Prereq: BIOL 220 and 221 or permission of instructor
Offered in even-numbered years.

BIOL 425 W 2C,3L 0.5
The Flowering Plants
Students entering this course are required to make a flowering plant collection. Instructions should be obtained from the Herbarium prior to the summer break.
(Formerly BIOL 384)

BIOL 426 W 2C,3L 0.5
Applied Phycology
Algae in human affairs and the environment. Topics examined include algal ecology; algae and organic, thermal, metal and acid pollution; cultural eutrophication; toxic algae; uses of algae for food; algal products; mass culture of microalgae and macroalgae.
Prereq: BIOL 220 or 221 or permission of instructor

BIOL 427X W 2C,3L 0.5
Environmental Physiology
A study of the physiological processes used by plants and animals to respond to changes in the physical environment. The adaptation process will be examined from the molecular to the organismal level.
Prereq: BIOL 250 and one of the following: BIOL 273, 423, 436 or 470
(Formerly BIOL 433)

BIOL 428 F 2C,3L 0.5
Plant Growth Regulation: Biochemical and Molecular Perspectives
A study of the molecular and biochemical processes that control development in plants with emphasis on the growth-regulating compounds and their interactions.
(Formerly BIOL 432)

BIOL 432X F 3C 0.5
Biotechnology 1
Genetic engineering entails the directed alteration of the hereditary apparatus of cells. The applications of recombinant DNA technology will be examined including the use of restriction endonucleases, cloning vehicles, transformation procedures, screening methods and expression of cloned genes.
Prereq: BIOL 437 and 440 or permission of instructor
(Formerly BIOL 480)

BIOL 433X W 3C 0.5
Biotechnology 2
In biotechnology, biological processes are harnessed for large scale industrial applications. Techniques and applications of animal cell culture, plant cell culture and microbial enzymology are reviewed.
Prereq: BIOL 220 and BIOL 230 or permission of instructor
(Formerly BIOL 491)

BIOL 434 F 3C/S 0.5
Human Molecular Genetics
Recent advances in human molecular genetics will be examined with emphasis on (i) how molecular biology is used to locate and isolate disease-causing genes and (ii) the molecular basis of human cancer.

BIOL 436 W 2C,3L 0.5
Cell Physiology
The functional organization of cells with particular reference to cell-cell interaction, the structure, function and development of organelles and the biological roles of cellular membranes.
Prereq: BIOL 230
(Formerly BIOL 331)

BIOL 437 F,S 2C,3L 0.5
Molecular Biology
Structure, expression and regulation of prokaryotic and eukaryotic genes, including DNA replication, transcription and protein synthesis. Introduction to recombinant DNA technology.
Prereq: BIOL 230 and 239 or permission of instructor
(Formerly BIOL 330)

BIOL 439 W 3C 0.5
Biochemistry of Natural Products
The chemistry, functions and distribution of natural products including alkaloids, isoprenoids, amines, phenolics, cyanogenic glycosides and other important compounds in plants and other biological systems.
Prereq: At least one full-year course or equivalent in organic chemistry plus a one-term course in biochemistry that includes the essentials of carbohydrate and fat metabolism

BIOL 440 F,S 2C,3L 0.5
Microbial Biotechnology
The role of genetically manipulated microorganisms in biotechnology. Topics examined include the principles of recombinant DNA technology and the development of microorganisms important in biotechnology.
Prereq: BIOL 240/241 or permission of instructor
It is recommended that this course be taken after completion of second year.
(Formerly BIOL 342)

BIOL 441 F 2C,3L 0.5
Immunology
Physical and biological properties of immunological agents that protect against disease, the procedures for their identification and their practical applications.
Prereq: BIOL 240/241

BIOL 442 W 2C,3L 0.5
Virology
A survey of viral structures, life cycles, and the interactions of viruses with microbial and animal hosts. Laboratory experiments involve procedures used for viral detection and titration.
Prereq: BIOL 240/241 and BIOL 437 or permission of instructor

BIOL 443 F 2C,3L 0.5
Microorganisms of Industrial Importance
A study of the role of microorganisms in industrial processes of biosynthesis and degradation.
Prereq: BIOL 240/241

BIOL 444 W 2C,3L 0.5
Microorganisms and Disease
A study of the microorganisms involved in pathogenesis, their mode of infection, symptoms and prevention.
Prereq: BIOL 240/241
BIOL 445 W 2C,3L 0.5 Microorganisms in Foods
Food preservation, spoilage, poisoning and modern concepts in quality assurance programs are studied. The aim is to understand factors governing microbial changes in foods. Problem solving microorganisms. Examples from fresh-

BIOL 446 F 2C,3L 0.5 Microbial Ecology
A study of the ecological roles of microorganisms. Examples from freshwater, terrestrial, marine and other ecosystems will be used to illustrate the activities and importance of microorganisms in these habitats.

BIOL 447 W 2C,3L 0.5 Environmental Microbiology
A study of the environmental impact of microorganisms. Aspects of pollution, waste treatment, biodegradation of environmental contaminants, and nutrient cycling will be examined.

BIOL 448 F 2C,3L 0.5 Microbial Physiology 1
A study of the physiology of microorganisms including multiphasic and synchronous growth, cell permeation, nutrition, physical and chemical environmental factors and metabolic mechanisms as elucidated by radioactively labelled tracers.

BIOL 449 W 2C,3L 0.5 Microbial Physiology 2
A study of the physiology of microorganisms with emphasis on synthetic and assembly processes. Mechanisms underlying the biosynthesis of DNA, protein, stable RNA, peptidoglycan, phospholipids, lipopolysaccharides and polysaccharides as well as assembly of the cell envelope, the nucleoid and polysomes will be discussed.

BIOL 450 F 2C,3S 0.5 Marine Biology
An examination of coastal and offshore marine environments. Physical and chemical oceanography, plankton, benthos, fish and marine tetrapods are discussed.

BIOL 451 W 3C 0.5 Limnology
A study of the Biology, Chemistry and Physics of lakes and streams, with emphasis on biological processes and their interactions with the environment. Familiarity with basic statistics and with the plant and animal kingdoms is assumed.

BIOL 452 F 2C,3S/lab 0.5 Fisheries Biology
The practices of fisheries biology; life history; age and growth, fecundity, production, harvest and management of fisheries resources.

BIOL 453 W 2C,1T 0.5 Population Ecology
The ecology of populations. Topics include: demographic parameters and their estimation, population growth and regulation, competitive and predator-prey interactions; population genetics and evolution; applied population biology.

BIOL 454 F,S 2C,3L 0.5 Environmental Toxicology 1
An introduction to the basic theories, principles and techniques of environmental toxicology. A comparative study of the effects of specific groups of toxicants on ecosystems; biodegradation and cycling.

BIOL 455 F 2C,3L 0.5 Environmental Toxicology 2
Cellular, developmental and physiological effects of toxicants on multicellular organisms.

BIOL 456 W 2C,3/lab/T 0.5 Population Biology
The analysis of the structure and dynamics of plant and animal populations. Theoretical, mathematical and experimental approaches to the study of population ecology and population genetics.

BIOL 457 F 2C,3/lab/T 0.5 Analysis of Communities
A study of the organization, structure and development of communities with emphasis on vegetation change. Topics include: sampling procedures; diversity; stability; succession; niche; multivariate analysis.

BIOL 458 F 2C,3L 0.5 Behavioural Ecology
This course will deal with the survival value of behaviour. It will concentrate on how ecological selection pressures associated with acquiring resources and reproducing influence how animals behave. A strong emphasis will be placed on the ultimate causation of behaviour i.e. the evolutionary basis for behaviour.

BIOL 459 W 3C/S 0.5 Evolution
A study of the processes of evolution; the differentiation of populations and the origin of new forms of life.

BIOL 461 W 3C 0.5 Statistics and Experimental Design
Design and analysis of experiments: analysis of variance; experimental designs; factorial experiments; models; missing data; transformations; a-priori and a-posteriori comparisons among means; regression and correlation analysis; analysis of covariance; circular data.

BIOL 470 F,S 2C,3L 0.5 Comparative Animal Physiology 1
The comparative physiology of animals with particular emphasis on homeostatic principles as demonstrated by water balance, excretion, nutrition, digestion and the endocrine system.

BIOL 474 F,S 2C,3L 0.5 Comparative Animal Physiology 2
The comparative physiology of animals with particular emphasis on homeostatic principles demonstrated by water balance, excretion, nutrition, digestion and the endocrine system.
BIOL 471 W 2C,3L 0.5
Comparative Animal Physiology 2
A comparative study of the sense organs and the nervous, endocrine, circulatory and respiratory systems. The lectures emphasize development and function of regulatory processes and include examples of vertebrate adaptations to high altitude and diving. Prereq: BIOL 273
(Formerly BIOL 338)

BIOL 473X W 2C,3L 0.5
Vertebrate Reproductive Physiology
(formerly Mammalian Reproductive Physiology)
A study of the endocrine and reproductive systems of vertebrates. Major topics include hormone secretion, mechanism of hormone action, hypothalamic regulation of pituitary function, ovarian and testicular physiology, hormone assays, gametogenesis and fertilization.
Prereq: BIOL 273 recommended
(Formerly BIOL 431)

BIOL 481 W 2C,3L 0.5
Introductory Quaternary Ecology
An introduction to Quaternary ecology. The morphology, biostratigraphy, distribution and paleoecological significance of major plant and animal groups in the Quaternary sciences. Relationships of fossil assemblages to modern ecosystems. Students will be expected to arrange with the instructors a field trip in the preceding term.
Prereq: EARTH 440 or consent of instructors
Cross-listed as EARTH 441

BIOL 490A/B F,W,S flslab 0.5/0.5
Field Course in Marine Biology
A two-week study of marine environments and biota. Emphasis on the flora and fauna of rocky shores, mud flats, and the sub-littoral benthos. Grade based on a field notebook and a research project. This course will normally be held at Huntsman Marine Laboratory, St. Andrews, NB. The course has a strong emphasis on field research and each student must complete a research project. Lectures will introduce the evolution, zoogeography, ecology and behaviour of whales, seals and sea lions. Additionally, marine-mammal fisheries will be dealt with in both lecture and laboratory work.
Prereq: BIOL 250 or equivalent
Field trip fee: $300-$400

BIOL 492 F,W,S flslab 0.5
Introduction to Marine Mammals
A two-week field course at the Huntsman Marine Laboratory, St. Andrews, NB. The course has a strong emphasis on field research and each student must complete a research project. Lectures will introduce the evolution, zoogeography, ecology and behaviour of whales, seals and sea lions. Additionally, marine-mammal fisheries will be dealt with in both lecture and laboratory work.
Prereq: BIOL 492
Field course fee: $325-$500

BIOL 493 Field Course in Terrestrial and Aquatic Biology
A two-week study of the flora and fauna of terrestrial environments, lakes and streams. Emphasis on biosystematics, distribution and dynamics of organisms. Both population and community approaches are stressed. This course will normally be held in Algonquin Park, Ontario each September. Courses sponsored by Ontario Universities at other times of the year may also qualify.
Prereq: BIOL 250 or equivalent
Field trip fee: $300-$400

BIOL 499A/B F,W,S flslab 0.5/0.5
Field Course in Terrestrial and Aquatic Biology
A two-week study of the flora and fauna of terrestrial environments, lakes and streams. Emphasis on biosystematics, distribution and dynamics of organisms. Both population and community approaches are stressed. This course will normally be held in Algonquin Park, Ontario each September. Courses sponsored by Ontario Universities at other times of the year may also qualify.
Prereq: BIOL 250 or equivalent
Field trip fee: $300-$400

Biological Sciences

CDN ST 101 F 2C,1S 0.5
Landforms and Mindscapes
An introduction to the Canadian landscape and its early impact upon the creative imagination of Canadians. The course provides a basis for dealing with contemporary Canadian culture.

CDN ST 102 W 2C,1S 0.5
Canadian Cultural Narratives: Facts, Fictions and Truths
Do historically-based Canadian books and films repeat accepted facts, or do they rewrite them to suit present needs? A comparison of documentary and fictionalized narratives as seen in historical writing, novels, journalism, poetry, and films.

CDN ST 201 F 3S 0.5
Social Regionalism
Lecturers from various social scientific disciplines examine Canada region by region, looking at how economic disparities, federal-provincial and heartland-hinterland relations, social elites, political parties, etc., influence Canadian regionalism. Focuses on current issues.

CDN ST 202 W 2C,1S 0.5
Cultural Regionalism
Lecturers discuss the contribution made by literature, film, drama, and fine arts in defining distinctive regional identities in Canada. Particular attention is paid to the emergence of a distinctive Ontario culture.
CDN ST 301 F 3S 0.5
Regionalism: West
This course continues the exploration of Canadian regionalism by applying knowledge gained in CDN ST 201/202 to distinctive problems of the Canadian west and northwest. The focus of the seminar will vary according to the interests of the faculty and students.
Prereq: CDN ST 101, 201 or 202 or permission of the instructor

CDN ST 302 W 3S 0.5
Regionalism: East
This course continues the exploration of Canadian regionalism by applying knowledge gained in CDN ST 201/202 to distinctive problems of Atlantic Canada. The focus of the seminar will vary according to the interests of the faculty and students.
Prereq: CDN ST 101, 201 or 202 or permission of instructor

CDN ST 300 W 3S 0.5
Les francophones hors Québec
Ce cours est offert à tous ceux qui veulent en savoir davantage sur la culture traditionnelle et populaire des Francophones vivant hors du Québec. Autour de ce thème central seront étudiés une variété de sujets présentés par des conférenciers invités: historiens, sociologues, éducateurs, artistes... que viendront de diverse régions du Canada français, du sud et du nord de l’Ontario, de l’Acadie, du Manitoba, ainsi que de l’Université de Waterloo.

CDN ST 313 S 3S 0.5
Canadian Traditional and Popular Culture
Studies traditional and popular bases for Canadian culture through interdisciplinary examination of verbal, musical, ritual, material, and belief heritage. reflected in a variety of social groupings: occupational, family, gender, age, community, ethnic, religious, linguistic and regional.

CDN ST 365 0.5
Special Topics
A course offered from time to time on a significant Canadian issue or theme using expertise available by special arrangement.

CDN ST 365D F,W,S 0.5
Reading Course

Chemical Engineering

Undergraduate Officer
I.F. Macdonald, E1-2513F, ext. 2413

Introductory Note
Prerequisite: For all courses in the Department of Chemical Engineering, registration in the Department or permission of the Associate Chair (Undergraduate Studies) is a requirement.

CH E 007 F,W,S 1C 0 Seminar
Informal discussions on the Chemical Engineering program.

CH E 100 F 3C,1T,6L for first 6 weeks 0.75
Chemical Engineering Concepts 1
An introduction to the basic methods and principles used by engineers in the analysis and design of physical processes: units, dimensions, and measurements; mass balances; behaviour of fluids. Laboratory on visual communication is included.

CH E 101/202 F,W/S,F 1C 0 Seminar
General Seminar

CH E 201 F,W 3C,1T 0.5
Transport Processes 1 (Equilibrium Stage Operations)
Equilibrium between phases; the equilibrium stage concept. Cascades of stages with and without reflux: group methods and stage-by-stage approaches; graphical solutions. Applications in the separation of components by distillation, absorption, stripping, extraction and leaching.
Prereq: CH E 100 and CH E 101

CH E 202 F,W 3C,1T 0.5
Applied Mathematics 1 (Statistics)
Introduction to statistical ideas, probability theory, distribution theory, sampling theory, confidence intervals and significance tests. Introduction to regression analysis. Introduction to design of experiments and statistical quality control.

CH E 203 F,W 3C,1T,3L for first 6 weeks 0.5
Physical Chemistry 1
Prereq: CH E 101 and CH E 102 'Alternate weeks

CH E 205 S,F 3C,2L 0.5
Transport Processes 2 (Fluid Mechanics)
Course Descriptions
Chemical Engineering

CH E 044 S,F 3C 0.5
Economics for Chemical Engineering

CH E 045 S,F 2C,3T 0.5
Process Equipment Sizing and Selection
Introduction to practical engineering methods, including standard computer packages, for specifying or selecting types of equipment commonly used in various process industries. Topics include: piping systems; control valves; pumps; compressors, fans and blowers; heat exchangers; tower contactors for one- and two-phase flow; mechanically agitated contactors, mixers, reactors; pressure vessels; materials of construction; special topics, as appropriate.
Prereq: CH E 035, CH E 036

CH E 047 W 12L 1.0
Group Design Project
Student design teams of two to four members work on design projects of industrial scope and importance under the supervision of a faculty member.
Antireq: CH E 048

CH E 048 W 9L 0.75
Research-Design Project 2
A continuation of CH E 043. The individual research or design project started and presented in proposal form in 4A is carried out. An oral presentation of results and a written report are required.
Prereq: CH E 043
Antireq: CH E 047

CH E 512 W 3C 0.5
Separation Processes
Computational approaches in the design of multiple component separation processes. Energy requirements. Capacity and efficiency of contacting devices: distillation; absorption; liquid-liquid extraction; filtration; molecular sieves; membranes; ion exchange.
Prereq: CH E 021, CH E 033 and CH E 035

CH E 514 W 3C 0.5
Fundamentals of Petroleum Production
Background for understanding the physical principles involved, and the terminology used, in petroleum production. Fundamentals of surface chemistry; capillarity. Characterization of, and fluid flow through, porous media. Principles of oil production performance, water flooding and enhanced oil recovery techniques.

CH E 522 W 3C 0.5
Advanced Process Dynamics and Control
Prereq: CH E 041

CH E 524 W 1C,3L 0.5
Process Control Laboratory
Experiments on process dynamics, control and simulation of processes. Time constant; step and frequency response; controller tuning; multivariable control strategies. Implementation using simulation systems, mainframe computers control, microcomputers.
Prereq: CH E 037 and CH E 041
Coreq: CH E 522

CH E 542 W 6C 1.0
Polymerization and Polymer Properties

CH E 552 W 3C 0.5
Extractive Metallurgy 1 (Hydrometallurgy)
Introduction to extractive metallurgy: ores, minerals, metals, metalloids, geology. Ore and mineral dressing. Thermodynamic and kinetic considerations. The extraction-refining-winning of industrially important metals: zinc, uranium, copper, nickel, gold, silver, aluminum and magnesium. Biohydrometallurgy.
Prereq: CH E 033, CH E 034 and CH E 038

CH E 554 W 3C 0.5
Extractive Metallurgy 2 (Pyrometallurgy)
In-depth discussion of several processes of importance in Canada: blast-furnace smelting (iron, lead, zinc); steelmaking and other specialized refining processes. Pyrometallurgical treatment of sulphide ores. Fused salt electrolysis. The emphasis is on the interplay between the underlying thermodynamics, kinetics and transport processes, and on the associated process engineering considerations.

CH E 562 W 3C 0.5
Fermentation Engineering
Application of process engineering principles to the design and operation of fermentation reactors which are widely used in the pharmaceutical, food, brewing and waste treatment industries. Aspects of mass transfer, heat transfer, mixing and rheology with biochemical and biological constraints.
Prereq: CH E 032

CH E 564 W 3C 0.5
Food Process Engineering
Applications of unsteady and steady state heat and/or mass transfer operations to processing natural and texturized foods. Design and analysis of sterilization, low temperature preservation, concentration, separation and purification processes. Effects of formulation, additives and processing on organoleptic and nutritional quality.
Prereq: CH E 032

CH E 572 W 3C 0.5
Air Pollution Control
Treatment of gaseous waste products from representative Canadian industries. Characterization and toxicity of filtration, scrubbing, cycloning, electrostatic precipitation and other chemical treatments. Legal, sociopolitical, economic and engineering aspects.

CH E 574 W 3C 0.5
Treatment of Aqueous Inorganic Wastes
Introduction to separation/treatment of aqueous inorganic wastes from chemical and metallurgical processes. Separation/treatment methods discussed include ion exchange, reverse osmosis, adsorption, ion flotation, electromembrane solvent extraction, electro-oxidation and electro-reduction. Legal, economic and social implications.
Chemistry

Undergraduate Officers
G.F. Atkinson, C2-260A, ext. 3000
M.F. Tchir, C2-382, ext. 3022
G. E. Too good, ESC 140, ext. 3514,
(sabbatical 1991/92)

Some courses are regularly given every other year, and are listed in their regular places.

Introductory Note
In all cases, it is the student's responsibility to determine eligibility to enter a course. It is advisable to obtain special consents in writing before registration period to avoid delays and complications.

Most 300- and 400-level courses are listed as two lecture hours. An additional hour may be scheduled at the discretion of the lecturer, usually for a tutorial.

COURSES CARRYING NO UNIVERSITY CREDIT

CHEM 001
Pre-University Chemistry
The course covers the material considered essential preparation for first year chemistry courses. Included are formulae, nomenclature, stoichiometry, an introduction to thermochemistry, solution chemistry, chemical equilibria, acids, bases, oxidation-reduction reactions, kinetics and bonding.

Successful completion of this course fulfills the University Admission requirements where high school chemistry is necessary. No University credit. Offered by correspondence only.

CHEM 010 F,W 1C 0.0
General Chemistry Seminar
Required for all Chemistry students beyond Year One, this seminar brings together students from all years to receive information concerning the activities of the Chemistry Department and The Chemical Institute of Canada, and to hear invited speakers.

YEAR 1 CHEMISTRY COURSES

CHEM 116 W 3C 0.5
Chemical Concepts for the Applied Health Sciences
This course gives the background in chemistry necessary for understanding physiological and biochemical topics in the applied health sciences. Relevant concepts and facts are presented and illustrated by examples from the life sciences. Topics include approaches to calculating and problem-solving, general chemistry focused towards applied health sciences, and the chemistry of specific organic functional groups.

Prereq: OAC Chemistry or permission of instructor
Antireq: CHEM 120/121, 123/125
CHEM 116 cannot be counted for credit towards a BSc degree in the Faculty of Science.

CHEM 120 F 3C,1T 0.5
Physical and Chemical Properties of Matter
The stoichiometry of compounds and chemical reactions. Properties of gases. Periodicity and chemical bonding. Energy changes in chemical systems. Electronic structure of atoms and molecules; correlation with the chemical reactivity of common elements, inorganic and organic compounds. Ionic solids and other extended arrays. Materials and processes in chemical industry.

Prereq: OAC Chemistry, Mathematics (Calculus)
Coreq: (for Science Students) CHEM 120L
Antireq: CHEM 121

CHEM 120L F 3L 0.25
Chemical Reaction Laboratory 1
Selected experiments for students taking CHEM 120 or 121.

CHEM 121 F 3C,1T 0.5
Physical and Chemical Properties of Matter
An enriched version of CHEM 120 for all students in, or planning to enter, Chemistry and Biochemistry programs.

Prereq: Same as for CHEM 120
Coreq: Same as for CHEM 120
Antireq: CHEM 120

CHEM 123 W,S 3C,1T 0.5
Chemical Reactions, Equilibria and Kinetics

Prereq: CHEM 120 or 121
Coreq: (for Science Students) CHEM 123L
Antireq: CHEM 125

CHEM 123L W,S 3L 0.25
Chemical Reaction Laboratory 2
Selected experiments for students taking CHEM 123 or 125.

CHEM 124 W,S 0.5
Organic Chemistry 1
Bonding in carbon compounds. Structures, properties and nomenclature of several important classes of organic compounds. Interconversions of functional groups. Mechanisms of organic reactions.

Prereq: Grade 13 Chemistry or equivalent
CHEM 120 or 123 strongly recommended
Offered by Correspondence only.
Not for students intending to major in Chemistry or Biochemistry.

CHEM 125 W,S 3C,1T 0.5
Chemical Reactions, Equilibria and Kinetics
An enriched version of CHEM 123 for all students in, or planning to enter, Chemistry or Biochemistry programs.

Prereq: Same as for CHEM 123
Coreq: Same as for CHEM 123
Antireq: CHEM 123

CHEM 129 W,S 3C,2L 0.5
Introductory Spectroscopy
The electromagnetic spectrum and the production and detection of photons in various energy ranges. Elementary descriptions of atomic and molecular spectra and their use in the locations of energy levels. The use of spectra to elucidate energy states of atoms and molecules to determine molecular structure. Aspects of ultraviolet, visible, infrared, Hamann, microwave and nuclear magnetic resonance spectroscopies. For students in, or planning to enter, Chemistry or Biochemistry programs.

Prereq: CHEM 120 or 121
Lab alternate weeks
Course Descriptions
Chemistry

UPPER YEAR CHEMISTRY COURSES

CHEM 226 F, W 3C, 3L 0.5
Organic Chemistry 1
Basic chemistry of aliphatic compounds; shapes of molecules. A laboratory course on preparative organic chemistry accompanies the lectures.
PreReq: Grade 13 or OAC Chemistry
Antireq: CHEM 124, 124L, 126, 264, 266
For students in Year Two Engineering

CHEM 036 F, S 3C 0.5
Organic Chemistry 2
Survey of aliphatic and aromatic chemistry with examples from industrial processes; carbohydrates and other natural products.
PreReq: CHEM 226
Antireq: CHEM 285, 287
For students in Year Two Engineering

CHEM 212 F, W 3C 0.5
Structure and Bonding
Structure and symmetry of Main Group and Transition Metal compounds. Valence bond, molecular orbital and ligand field theories applied to polyatomic molecules. Descriptive chemistry of selected elements and compounds.
PreReq: CHEM 120 or 121
Antireq: CHEM 218
For Honours students only

CHEM 218 F 2C, 1T 0.5
Development of Chemical Bonding and Structure
PreReq: CHEM 120 or 121
Antireq: CHEM 212

CHEM 219 W 0.5
Chemistry of Non-Transition Elements
Group trends in main group chemistry. Emphasis will be placed on correlation of structure with physical properties in various groups of compounds.
PreReq: CHEM 212 or 218
By correspondence only

CHEM 220 F, W 2C, 1T 0.5
Introductory Analytical Chemistry
The principles underlying quantitative measurements.
PreReq: CHEM 123 or 125, 123L
Coreq: (for Science students) CHEM 220L
Antireq: CHEM 228
For Honours students only
Not offered in 1991-92

CHEM 220L F, W 3L 0.25
Analytical Chemistry Laboratory 1
Selected experiments for students taking CHEM 220.
For Honours students only
Not offered in 1991-92

CHEM 221 F 2C 0.5
Multi-component Analysis
Electrochemical, spectroscopic and separation methods for the quantitative description of multi-component systems.
PreReq: CHEM 220
Coreq: (for Science students) CHEM 221L
Antireq: CHEM 228
For Honours students only
Last offering Fall 1991

CHEM 221L F 6L 0.5
Analytical Chemistry Laboratory 2
Selected experiments for students taking CHEM 221.
For Honours students only
Last offering Fall 1991

CHEM 223 F, W 3C, 1T 0.5
Analytical Chemistry
Modern quantitative analytical chemistry including classical and more recent methods. Emphasis on planning and decision-making in the analytical process.
PreReq: CHEM 123 or 125, 123L
Coreq: (for Science students) CHEM 223L
Antireq: CHEM 228
For Honours students only

CHEM 223L F, W 3L 0.25
Analytical Chemistry Laboratory 1
Selected experiments for students taking CHEM 223.
PreReq: CHEM 123L
Coreq: CHEM 223
For Honours students only. Priority will be given to students with programs requiring this course.

CHEM 224L W, S 1T, 6L 0.5
Analytical Chemistry Laboratory 2
Extensive lab experience for students who have taken CHEM 223.
PreReq: CHEM 223, 223L
For Honours students only. Priority will be given to students with programs requiring this course.

CHEM 228 W 2C, 3L 0.5
Analytical Chemistry for Life Sciences
Selected topics of importance to biology students, with related experiments.
PreReq: CHEM 123 or 125
Antireq: CHEM 220, 221
For students in Honours Biology only

CHEM 233 F, S 3C 0.5
Fundamentals of Biochemistry
Chemistry of amino acids, carbohydrates, lipids and nucleic acids, with special emphasis on representative proteins and enzymes, including hemoglobin, cytochrome c and chymotrypsin.
PreReq: CHEM 264 or permission of instructor
Antireq: CHEM 237
For students in the Honours Biochemistry or the Honours Biology and Chemistry programs only

CHEM 237 F, W 3C 0.5
Introductory Biochemistry
An introduction to the chemistry of amino acids, carbohydrates, lipids and nucleic acids. Structure and properties of proteins and enzymes.
PreReq: CHEM 264 or 266
Antireq: CHEM 233

CHEM 237L F, W 3L 0.25
Introductory Biochemistry Laboratory
Selected experiments for students taking CHEM 237.

CHEM 254 F, W 2C, 1T 0.5
Chemical Thermodynamics 1
An introduction to the thermodynamics of ideal systems and the first, second and third laws of thermodynamics; the application of thermodynamic principles to the study of solutions, phase equilibria, chemical equilibria, and the properties of electrolytes.
PreReq: CHEM 123 or 125, MATH 113A/B or equivalent
Antireq: CHEM 356
For Honours students only
CHEM 265 W,S 2C,1T 0.5
Introduction to Quantum Mechanics
Introduction to the microscopic description of physical processes, laws governing electrons and atoms and the properties of atomic and molecular states, application to electromagnetic radiation interacting with atoms and molecules producing transitions between states.
Prereq: CHEM 123 or 125
Coreq: MATH 215 or equivalent
Antireq: PHYS 234, 334, AM 373
For Honours students only

CHEM 266 F,W 3C 0.5
Basic Organic Chemistry 1
Preparation and reactions of typical organic functional groups examined on the basis of reaction mechanisms. Stereocchemistry of organic molecules.
Prereq: CHEM 123 or 125
Antireq: CHEM 026, 266
For Honours students only

CHEM 266L F,W,S 3L 0.25
Organic Chemistry Laboratory
Selected experiments for students taking CHEM 266.
Lab Alternate weeks

CHEM 267 W 2C 0.5
Basic Organic Chemistry 2
A continuation of the concepts of CHEM 266, including material on aromaticity, carbohydrates, proteins and lipids. Introduction to nuclear magnetic resonance and infrared spectroscopy.
Prereq: CHEM 266 or equivalent
Antireq: CHEM 036, 265

CHEM 267L W 3L 0.25
Organic Chemistry Laboratory
Selected experiments for students taking CHEM 267.
Lab Alternate weeks
For students needing a full year of Organic Chemistry as a prerequisite to medicine, the sequence CHEM 266/267 and CHEM 266L/267L should be selected. Students who, at the same time, wish to obtain a Minor in Chemistry should consult the Chemistry Undergraduate Officer.

CHEM 312 F,S 2C,1T 0.5
Transition Metal Chemistry
The transition elements and their compounds. Stereocchemistry of complex ions; ligand field and molecular orbital theories of metal-ligand bonding; electronic spectra and magneto-chemistry of complexes; reaction mechanisms (if time permits).
Prereq: CHEM 212
Antireq: CHEM 316
For Honours students only

CHEM 312L F,W,S 6L 0.5
Inorganic Chemistry Laboratory
Experiments appropriate to the inorganic chemistry program.
Coreq: CHEM 312 or 313
For Honours students only

CHEM 313 W 2C,1T 0.5
Chemistry of Inorganic Solid State Materials
Introduction to the structure and bonding of ionic and covalent solids; crystal defects and non-stoichiometry; relationships between structure and electrical properties of solids including metallic conductivity, semiconductivity, superconductivity and ionic conductivity; special topics including one of: fast ion conductors, piezoelectric and ferroelectric oxides; magnetic oxides.
Prereq: CHEM 212
For Honours students only

CHEM 315L F,W 6L 0.5
Advanced experiments in inorganic chemistry.
Prereq: CHEM 314L
Last offering 1991-92 for students who have already taken CHEM 314L
CHEM 357 W 2C,1T 0.5
Physical Biochemistry
The use of diffusion, ultracentrifugation, osmotic pressure, electrophoresis and X-ray diffraction to study the properties of biopolymers. Hyperbolic and allosteric enzyme kinetics, inhibition and regulation. Some spectroscopies important to the life sciences.
Prereq: CHEM 123 or 125, 233 or 237, MATH 115A/B or equivalent

CHEM 358L F,W 6L 0.5
Physical Chemistry Laboratory 2
Selected experiments for students in the 3B term.
Prereq: CHEM 355L
For Honours students only

CHEM 359 F,S 2C,1T 0.5
Kinetics and Dynamics
A course in chemical kinetics, which includes recent developments in reaction dynamics. Topics covered: rates and mechanisms of chemical reactions (rate laws, treatment of kinetic data, reaction mechanisms, complex and fast reactions); theory of reaction rates (collision theory, activated complex theory); selected recent topics, such as laser chemistry, atmospheric chemistry, heterogeneous catalysts.
Prereq: CHEM 254,256
For Honours students only

CHEM 366 W 2C 0.5
Structural and Synthetic Organic Chemistry
Stereochemistry in organic reactions; synthesis of selected organic compounds examined in detail with emphasis on cyclo-addition reactions and condensation reactions.
Prereq: CHEM 265 or 267
Antireq: CHEM 368

CHEM 366L W 3L 0.25
Organic Chemistry Laboratory
Selected experiments for students taking CHEM 366.

CHEM 368 F,W,S 2C 0.5
Organic Chemistry 3
The design of organic syntheses, and especially the formation of enolate ions and their use in the formation of new carbon-carbon bonds. Acidity and basicity of organic molecules. Stereocchemical concepts applied to organic molecules as well as conformational analysis.
Prereq: CHEM 265
Antireq: CHEM 366
For Honours students only

CHEM 368L F,W,S 6L 0.5
Organic Chemistry Laboratory 2
Selected experiments for students taking CHEM 368.
For Honours students only

CHEM 392A F,W,S 9L 0.75
Research Project 1
For students in the Honours Chemistry (Thesis Option) program.

CHEM 392B F,W,S 18L 1.5
Research Project 2
For students in the Honours Chemistry (Thesis Option) program.

CHEM 407 W 2C 0.5
Industrial Chemistry
Given entirely by invited lecturers from a broad spectrum of chemistry-related industries. The range of topics will include current industrial laboratory practice, the laboratory/plant interface, and the handling of large quantities of materials.

CHEM 411 F 2C 0.5
Organometallic Chemistry
Prereq: CHEM 312

CHEM 412 F 2C 0.5
Radiochemistry
Prereq: CHEM 120 or 121

CHEM 413A-Z 2C 0.5
Special Topics in Inorganic Chemistry
For a current list of offerings see the Undergraduate Officer.
Prereq: CHEM 333

CHEM 421 W 2C 0.5
Mass Spectrometry
Principles involved in the use of electric and magnetic fields for mass analysis, ionization methods. Applications of mass spectrometric analysis to the identification and quantitation of chemical compounds.
For Honours students only
CHEM 450 W 2C 0.5  
Spectroscopy and Molecular Structure  
Introduction to concepts and applications of microwave, Raman, IR, electronic and resonance spectroscopy with respect to molecular parameters.  
Prereq: CHEM 256

CHEM 451 W 2C,1T 0.5  
Chemical Thermodynamics 2  
This course extends the introduction provided by CHEM 254 to the thermodynamics of non-ideal systems. Topics covered include: the phase rule and phase diagrams, the Clausius-Clapeyron equation, fugacity and its application to non-ideality in gases, partial molar properties, ideal and non-ideal solutions, colligative properties, electrolyte solutions, electrochemical thermodynamics.  
Prereq: CHEM 254

CHEM 454 F 2C 0.5  
Surface Chemistry  
An introduction to the physical chemistry of surfaces. Qualitative and quantitative descriptions of surfaces and interfaces and the development of relevant techniques and theories. Application to surface tension, spreading, wetting, adsorption, and other interfacial phenomena.  
Prereq: CHEM 254

CHEM 455 F 3C 0.5  
Electrochemistry  
Electrolytic conductance and transport, thermodynamics of electrolytic cells. Reversible and irreversible electrode processes, metallic corrosion. Study of selected industrial electrochemical processes.  
Prereq: CHEM 254 or 356

CHEM 456 W 2C 0.5  
Catalysis  
An introduction to heterogeneous catalysis. Examination of the physical manifestations of catalysis and the development of experimental techniques and theoretical methods for the measurement and elucidation of catalytic phenomena.  
Prereq: CHEM 254

CHEM 458 F 2C 0.5  
Advanced Quantum Mechanics  
The nature of electronic structure and chemical bonding in $H_2$ and other simple molecules and its implications for theories of chemical reactions.  
Prereq: CHEM 256

CHEM 459 F 2C,1T 0.5  
Statistical Thermodynamics  
The statistical nature of large assemblies of atoms and molecules, kinetic theory of gases, transport processes, the collision theory and transition state theory of chemical kinetics.  
Prereq: CHEM 254,256  
Antireq: PHYS 359  
For Honours students only

CHEM 462 W (even years) 2C 0.5  
Mechanistic Organic Chemistry  
Simple molecular orbital theories and their use in organic chemistry. Effects of substituents and reaction conditions on the mechanisms of organic reactions.  
Prereq: CHEM 265  
Coreq: CHEM 368

CHEM 463 F (odd years) 2C 0.5  
Applied Organic Chemistry  
The organic chemistry involved in selected industrial processes will be discussed. Petroleum chemistry, synthesis of dyestuffs, pharmaceuticals, pesticides, organic polymers, etc.  
Prereq: CHEM 265 or 267

CHEM 464 F 2C 0.5  
Spectroscopy in Organic Chemistry  
Elucidation and identification of organic structures by contemporary spectroscopic techniques.  
Prereq: CHEM 265

CHEM 465 W 2C 0.5  
Special Topics in Organic Chemistry  
Topics will be selected from photochemistry, organometallics, synthesis, heterocyclics, natural products, molecular rearrangements. (May be taken in third and fourth year as 465A and 465B provided topics are different).  
Prereq: CHEM 265 or Coreq: CHEM 368

CHEM 470 F,S 3C 0.5  
Introduction to Polymer Science  
Basic definitions and polymer nomenclature, molecular weight averages and distributions, constitutional and configurational isomerism, rubber elasticity, step-growth and free radical chain growth polymerizations, emulsion polymerization.  
Prereq: CHEM 254, 264 or equivalents  
Antireq: CH E 542

CHEM 471 W 2C 0.5  
Polymer Properties and Polymerization  
Copolymerization, ionic and coordinate polymerizations, introduction to polymer reaction engineering, mechanical properties of polymers, polymer mixtures.  
Prereq: CHEM 470 or equivalent  
Antireq: CH E 542

CHEM 492A F 9L 0.75  
Advanced Laboratory  
Laboratory work on a senior year research project. See CHEM 492 co-ordinator for descriptive booklet and details.  
For Honours students only

CHEM 492B W 9L 0.75  
A continuation of CHEM 492. No credit or grade is given for the first term course unless the two term sequence, CHEM 492AB, is completed.

CHEM 495A F 18L 1.5  
Research Project 3  
Only for students in the Honours Chemistry (Thesis Option) program.

CHEM 495B W 18L 1.5  
Research Project 4  
Only for students in the Honours Chemistry (Thesis Option) program.

CHEM 496A-E F,W,S R 0.5  
Independent Study in the Defined Field of Study  
A - Analytical Chemistry  
B - Biochemistry  
C - Inorganic Chemistry  
D - Organic Chemistry  
E - Physical Chemistry  
Open to students in the Honours Chemistry (Thesis Option) program only.
## Course Descriptions
### Chinese
For courses in Chinese see East Asian Studies.

### Civil Engineering

**Undergraduate Officer**
B. LeLievre, E2-2332, ext 2851

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>Credits</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIV E 126</td>
<td>W,S 2C,4L/T 0.5</td>
<td>Civil Engineering Concepts</td>
<td>A continuation of GEN E 165 with applications of graphics, measurement and other analytic principles to introductory problems in the various disciplines of Civil Engineering; an introduction to engineering design methods as applied to Civil Engineering including specification development, information-gathering, concept formulation, feasibility analysis and report writing.</td>
</tr>
<tr>
<td>CIV E 203</td>
<td>F,W 2C,2T 0.5</td>
<td>Statics</td>
<td>Equilibrium of rigid and deformable bodies. Analysis of internal forces in structures; beams, cables, arches, trusses.</td>
</tr>
<tr>
<td>CIV E 204</td>
<td>F,W 3C,1T 0.5</td>
<td>Mechanics of Solids 1</td>
<td>Stress-strain-temperature relationships. Axial tension. Thin-walled pressure vessels. Torsion of shafts. Bending and shear in beams.</td>
</tr>
<tr>
<td>CIV E 205</td>
<td>F,S 3C,1T 0.5</td>
<td>Mechanics of Solids 2</td>
<td>Flexure, Strain Energy, Yielding and Buckling, Impact, Virtual Work. Influence Lines.</td>
</tr>
<tr>
<td>CIV E 223A</td>
<td>F,W 1C,3T 0.25</td>
<td>Computer Workshop A</td>
<td>An introduction to Microcomputers, Spreadsheets, Word Processors and the BASIC language. Workshop includes applications selected from Year Two Civil Engineering courses. Five weeks only For Civil and Geological Engineering students only.</td>
</tr>
<tr>
<td>CIV E 223B</td>
<td>S,F 1C,3T 0.25</td>
<td>Computer Workshop B</td>
<td>A continuation of CIV E 223A. Application to problems in Civil Engineering. Five weeks only For Civil and Geological Engineering students only.</td>
</tr>
<tr>
<td>CIV E 225</td>
<td>F,S 2C,2T 0.5</td>
<td>Geology for Engineers</td>
<td>A study of earth processes and earth materials from an engineering point of view. Topics include: mineral and rock identification, the rock cycle, structural geology, geology of Canada, effects of water, ice and wind. Description of aggregates used in engineering works.</td>
</tr>
<tr>
<td>CIV E 229</td>
<td>F 1 wk fld lab 0.5</td>
<td>Survey Camp</td>
<td>A one-week course in surveying. Introduction to surveying, length measurements, levelling, transit surveys. Approximate cost to each student: $75 (if paid by June 30th - $50).</td>
</tr>
<tr>
<td>CIV E 291</td>
<td>F 1 wk fld lab 0.5</td>
<td>Survey Camp</td>
<td>Five weeks only For Civil and Geological Engineering students only.</td>
</tr>
<tr>
<td>CIV E 300</td>
<td>W,S 2C,2T 0.5</td>
<td>Civil Engineering Project</td>
<td>The development of problem-solving skills utilizing the systems approach to the solution of Civil Engineering problems. Knowledge from previous courses and the practical application of the digital computer are integrated in a team/project-oriented environment. A written report and a verbal presentation are requirements.</td>
</tr>
<tr>
<td>CIV E 303</td>
<td>W,S 3C,1T 0.5</td>
<td>Structural Analysis</td>
<td>Beams, frames, arches, trusses, cables. Statically determinate structures. Statically indeterminate structures. Computer applications.</td>
</tr>
</tbody>
</table>
CIV E 313  F,W  3C,1T  0.5  
Structural Concrete Design 1  
Prereq: CIV E 303

CIV E 342  W,S  3C,1T  0.5  
Transport Principles and Applications  
Introduction to basic principles and procedures of transport planning and engineering, as applied to Canadian intercity transport problems.

CIV E 343  F  3C,1T  0.5  
Traffic Engineering  
Theories of road capacity; Capacity and quality of service on rural and urban roads. Traffic signals: capacity, delay, allocation and optimization of phase times. Control of combinations and networks of signals. Application of assignment in traffic models.

CIV E 344  F  3C,1T  0.5  
Urban Transport Planning  
The course develops a number of standard methods for predicting travel in urban areas. General characteristics of urban travel and urban transport systems are presented along with a discussion of typical issues pertaining to urban areas. Methods used to evaluate alternatives and resolve issues are presented. These include trip generation, trip distribution and mode split.

CIV E 353  W,S  3C,1T,2I  0.5  
Geotechnical Engineering 1  
An introduction to geologic processes. Subsurface exploration. Classification systems. Weight-Volume relationships. Soil mechanics principles including state of stress, ground water flow, consolidation and shear strength. 
Six lab sessions.

CIV E 354  F,W  3C,1T  0.5  
Geotechnical Engineering 2  
Prereq: CIV E 353

CIV E 375  W,S  3C,1T,2L  0.5  
Water Quality Engineering  
Six lab sessions.

CIV E 381  F,W  3C,1T  0.5  
Hydraulics  

CIV E 398  W,S  2S  0.0  
CIV E 399  F,W  2S  0.0  
Seminar  

CIV E 400  F,S  1C,3T  0.5  
Civil Engineering Project 2  
The purpose is to provide the students with an opportunity to demonstrate their capacity to engage in the practice of civil engineering as a profession. The students are encouraged to independently identify and resolve a problem within the scope of their chosen area of specialization utilizing knowledge gained from their academic and employment experiences. A written report and a verbal presentation are requirements.

CIV E 401  W  4T  0.5  
Civil Engineering Project 3  
An independent or team project dealing with engineering design or research, under the direction and with the consent of a faculty member.

CIV E 403  F,S  3C,1T  0.5  
Structural Analysis 2  
Advanced structural analysis of planar and space frameworks; linear and nonlinear behaviour. Computer Applications. 
Prereq: CIV E 303

CIV E 404  W  2C,2T  0.5  
Structural Analysis 3  
Approximate methods of analysis for a variety of structural forms. Application of approximate techniques to beams, building frames, shear wall structures, plates, buckling and vibration problems. Approximate structural design. 
Prereq: CIV E 313, 413

CIV E 405  W  3C,1T  0.5  
Structural Dynamics  

CIV E 407  W  2C,2T  0.5  
Building Science and Technology  
Prereq: CIV E 313, 413, 414 or consent of instructor

CIV E 413  F,S  3C,1T  0.5  
Structural Steel Design  
Prereq: CIV E 303

CIV E 414  S,F  3C,1T  0.5  
Structural Concrete Design 2  
Prereq: CIV E 313

CIV E 415  W  2C,2T  0.5  
Structural Systems  
Geometries, loads, safety and serviceability, structural idealizations. Building design and bridge design. Proportioning of components and structures in concrete, steel, masonry and wood.

CIV E 422  W  2C,2T  0.5  
Finite Element Analysis  
Introduction to the Finite Element Methods in field problems. Applications of the theory using available computer programs.

CIV E 430  W  2C,2L  0.5  
Experimental Mechanics  

CIV E 440  W  3C,1T  0.5  
Transport Systems Analysis  
Introduction to basic concepts of transport systems analysis: systems analysis framework, accounting methods, experimental design techniques, decision theory, basic approach to simulation modelling. The emphasis is on development of methods of analysis for application to selected case studies in the transport sector. 
Prereq: CIV E 342
CIV E 442 W 3C,1T 0.5  
Pavement Structural Design  
Pavement design, soil identification, subgrade design, base courses, flexible pavement design, design and testing of asphaltic concrete mixes, surface treatments.  
Prereq: CIV E 353  
CIV E 454 W 2C,2T 0.5  
Geotechnical Engineering 3  
Simulation of geotechnical consulting practice. Students are required to complete several projects, based on actual case studies, which require problem identification, evaluation of geotechnical data, analysis, design and report preparations.  
Prereq: CIV E 353, 354  
CIV E 460 F 3C,2T 0.5  
Orthopaedic Bioengineering  
Introduction of engineering technology to the field of orthopaedics. Specific topics deal with the repair and reconstruction of portions of the musculoskeletal system affected by trauma or pathological response. Primary study is directed toward the skeletal joints and major load-carrying structures. Students must have had background study in properties and mechanics of materials equivalent to CIV E 204 and CIV E 265. Registration in this course will be assessed on an individual basis through scheduled interviews.  
Cross-listed as GEN E 460  
CIV E 472 F,S 3C,1T 0.5  
Wastewater Treatment  
Introduction to wastewater treatment. Wastewater quantity, Wastewater characteristics, Primary treatment, Secondary treatment, Sludge treatment and disposal, Industrial wastewater management, Design project.  
Prereq: CIV E 375  
CIV E 473 W 2C,2T 0.5  
Contaminant Transport  
Prereq: CIV E 375  
CIV E 480 W 2C,2T 0.5  
Water Resources Management  
A course on water resource management problems in Canada. Description of basic areas of water resource management. Application of systems analysis and operations research techniques. Benefit-cost analysis. Social, political, legal and ecological considerations.  
Coreq: CIV E 381  
CIV E 483 W 2C,2T 0.5  
Design of Urban Water Systems  
Design of water supply and distribution systems. Design of sanitary sewer and storm water management systems. Concepts of urban infrastructure renewal. The course consists of 24 hours of lectures and a design project. The emphasis is on computer aided design, using commonly used water resources engineering software packages and computer graphics.  
Prereq: CIV E 375, 381 and 486  
CIV E 486 S,F 3C,1T 0.5  
Hydrology  
CIV E 491 W 3C 0.5  
Engineering Law  
Restricted to 4B Civil and Geological Engineering students  
CIV E 493 W 2C,2T 0.5  
Engineering in the Canadian North  
CIV E 496 W 2C,2T 0.5  
Construction Engineering  
CIV E 498 S,F 2S 0.0  
CIV E 499 W 2S 0.0  
Seminar  
The engineer in society. Principles, methods and practice of Civil Engineering. Informal lectures.  

Classical Studies  

Undergraduate Officer  
R. Porter, ML 227, ext. 2173  

CLASSICAL STUDIES  

(Courses in Translation)  

Introductory Notes  

1. Students should consult with the departmental Undergraduate Advisor for the latest information on course offerings. Some courses are offered in rotation.  

2. CLAS courses were formerly designated C CIV.  

CLAS 100 F,W 3C 0.5  
An Introduction to Classical Studies  
An introduction to Greek and Roman civilization, focusing on six key aspects of the discipline of classical studies: history, literature, philosophy, myth and religion, art and architecture, and classical archaeology.  

CLAS 101 W 3C 0.5  
Colossos - The Major Figures of Ancient Greece  
An introductory study of the achievement of ancient Greece through some of its most prominent figures. Each year two of the following will be featured: Homer and Heroic Greece; Pericles and the Rise of Democracy; Socrates, Man and Martyr; Alexander the Great and The Age of Expansion.
CLAS 102 F 3C 0.5
Colossae: The Major Figures of Ancient Rome
An introductory study of the achievement of ancient Rome through some of its prominent figures. Each year two of the following will be featured: Julius Caesar and the Collapse of the Republic; Augustus: The Empire Rises; Nero and the Corruption of Power; Hadrian and the Imperial Machine.

CLAS 201 F.W 3C 0.5
Ancient Greek Society
A survey of the civilization of Classical Greece, featuring such topics as the individual (male and female), political institutions, art, religion, philosophy, literature, social life and leisure activities.

CLAS 202 S,F,W 3C 0.5
Ancient Roman Society
A survey of the civilization of the Roman Republic and Empire, featuring such topics as the individual (male and female), political institutions, art, religion, philosophy, literature, social life and leisure activities.

CLAS 251 F 3C 0.5
Greek History
A survey of ancient Greece, emphasizing its political, military, social and economic aspects.

CLAS 252 W 3C 0.5
Roman History
A military, political, social and economic survey of Rome from earliest times to the Empire's fall.

CLAS 255 3C 0.5
Medieval Civilization 1
A study of medieval literature, art, architecture, music and other expressive forms. The period from late antiquity to A.D. 1200 will be studied.

CLAS 256 3C 0.5
Medieval Civilization 2
A study of medieval literature, art, architecture, music and other expressive forms. The period from A.D. 1200 to the Renaissance will be studied.

CLAS 257 F 0.5
Ancient Epic in Translation
This course examines ancient Greek through the Iliad and Odyssey of Homer, the Argonautica of Apollonius Rhodius and the Aeneid of Virgil. The evolution of the epic genre is traced in lectures and discussions. No knowledge of Greek or Latin is needed.

CLAS 266 3C 0.5
Ancient Tragedy in Translation
This course focuses upon the dramatic literature of the classical age in Athens. It features the Orestes of Aeschylus, the Oedipus plays of Sophocles and the Medea, Hippolytus and Bacchae of Euripides. Roman tragedy is also studied for comparative purposes through the plays of Seneca. No knowledge of Greek or Latin is needed.

CLAS 292 3C 0.5
Modern Issues in the Ancient World
A study of selected social problems in ancient Greece and Rome. Each year, two of the following will be examined: women in society, slavery and the labour force, the aged and infirm, human sexuality and sexual mores, children and education, minority groups and racial prejudice, war and conflict.

CLAS 301 F 3C 0.5
Ancient Myth and Religion 1
A study of Greek and Roman myth, including the birth of the gods, creation, the Olympians, Prometheus and the fall, the flood, the ages of man, and the Greek mystery religions. Not open to first-year students.

CLAS 302 W 3C 0.5
Ancient Myth and Religion 2
A study of Greek and Roman legend, including the cycles of Troy, Mycenae, Thobos; the Argonaut, the heroica, Odysseus; and the oriental mystery religions (with their relation to Christianity). Not open to first-year students.

CLAS 351 3C 0.5
Greek Art and Architecture
A survey of the art and architecture of the ancient Greek world from the Minoan to the Hellenistic periods. Not open to first-year students.

CLAS 352 3C 0.5
Roman Art and Architecture
A study of the art and architecture of the Roman world from Etruscan to Imperial Times. Not open to first-year students.

CLAS 356 3C 0.5
History of Ancient Philosophy 1
From the beginnings to Plato.

CLAS 361 3C 0.5
History of Ancient Philosophy 2
From Aristotle to the close of classical antiquity.

CLAS 365 3C 0.5
Ancient Comedy in Translation
The comedy of the ancient Greeks and Romans will be examined through selected plays of Aristophanes, Menander, Plautus and Terence. The different types of comedy, and their evolution, will be studied in lectures and discussions. No knowledge of Greek or Latin is needed.

CLAS 366 2S 0.5
Ancient Lyric and Satire in Translation
Lyric poetry of Greece and Rome, including Sappho, Pindar, Catullus, Horace and others; classical satire, including Horace, Petronius, Juvenal, Lucian. No knowledge of Greek or Latin is needed.

CLAS 371 3C 0.5
Christianity and the Roman Empire
This course examines the relationship between Christianity and the Roman Empire, dealing in particular with the Christians in the social context of the Roman Empire generally and its various regions.

CLAS 373 3C 0.5
The Fall of the Roman Empire
This course deals with the transition of the Roman Empire into the beginnings of the European states in the West and the Byzantine Empire in the East. Popular theories for the "decline and fall" of the old Roman Empire are examined.

Cross-listed as PHIL 380

Cross-listed as PHIL 381

Cross-listed as DRAMA 385

Cross-listed as DRAMA 385
CLAS 384 F 3C 0.5
Science and Technology of Ancient Greece and Rome
A study of scientific thought and achievements in such areas as astronomy, biology, anatomy and medicine, and of the technological skills which produced and distributed raw materials, manufactured goods and agricultural products.
Prereq: First year science or engineering course, or CLAS 201 or 202 or 251 or 252 or instructor's permission

CLAS 402 3C 0.5
The Aegean in the Bronze Age
A senior course concentrating on the Cycladic, Minoan and Mycenaean civilizations of the Bronze Age.
Prereq: CLAS 201, 251, 351 or Instructor's permission

CLAS 485 W 2C 0.5
Greco-Roman Civilization and History 1
Senior seminar; intensive study of various problems.
Prereq: Previous work in ancient history or instructor's permission

CLAS 486 2S 0.5
Greco-Roman Civilization and History 2
Senior seminar; intensive study of various problems.
Prereq: Previous work in ancient history or instructor's permission

GREEK

Introductory Note
Students should consult with the departmental Undergraduate Advisor for the latest information on course offerings. Some courses are offered in rotation.

GRK 100 A F 4C 0.5
Introductory Ancient Greek 1
A course designed for students beginning the study of ancient Greek or who have not yet reached the level expected in GRK 231/232. The teaching approach emphasizes exposure to simple texts as soon as possible, but students desiring minimal competence in reading should go on to do GRK 100B.
GRK 100A and RS 106A may not both be taken for credit.

GRK 100 B W 4C 0.5
Introductory Ancient Greek 2
Continuation of GRK 100A. Most of the rules of Greek grammar will be covered by the end of the year, and students should have a minimal competence in reading prose texts; but for the remaining grammar and further practice students should go on to do GRK 231.
Prereq: GRK 100A or RS 106A

GRK 231 F 3C 0.5
Intermediate Greek
The course will complete the study of Greek grammar and begin more extensive reading in Greek authors (normally Homer and Herodotus).
Prereq: GRK 201B, OAC or Grade 13 Greek or instructor's permission

GRK 232 3C 0.5
Selections from Greek Authors
A literature course designed to follow GRK 231. Authors normally read are Euripides, Thucydides and Plato.
Prereq: GRK 100B, OAC or Grade 13 Greek or instructor's permission

GRK 262 3C 0.5
Introduction to Plato
Selections from Plato.
Prereq: GRK 100B, OAC or Grade 13 Greek or instructor's permission

GRK 271 3C 0.5
Hellenistic and Later Greek Literature
Selections from Christian and pagan writers.
Prereq: GRK 100, Grade 13 or OAC Greek, or instructor's permission

GRK 351 F 2C 0.5
Advanced Composition and Grammar
Intensive study of Greek language and style through composition and translation.
Prereq: GRK 251, or consent of instructor

GRK 361 3C 0.5
The Drama of Euripides
An examination of the dramatic art of Euripides by translation of selected plays and the reading of other plays in translation.
Prereq: One full 200-level Greek course or instructor's permission

GRK 362 3C 0.5
The Drama of Sophocles
An examination of the dramatic art of Sophocles by translation of at least one play and the reading of others in translation.
Prereq: One full 200-level Greek course or instructor's permission

GRK 371 3C 0.5
Introduction to the Greek Historians
Selections from Xenophon and others.
Prereq: One full 200-level Greek course or instructor's permission

GRK 372 3C 0.5
Herodotus
Selections from the Persian Wars.
Prereq: One full 200-level Greek course or instructor's permission

GRK 391 3C 0.5
Advanced Greek Reading
A reading course designed to follow GRK 232 or GRK 262. By the end of the course students should be competent to read moderately difficult prose and poetic texts. Authors and teaching techniques will be chosen to fit the needs of the students.
Prereq: One full 200-level course in GRK or instructor's permission

GRK 452 3C 0.5
Homer
Extended reading of Homer.

GRK 461 2S 0.5
The Drama of Aeschylus
Selected plays.

GRK 462 W 2S 0.5
The Comedy of Aristophanes
An examination of the dramatic art of Aristophanes by translation of at least one play and the reading of others in translation.
LATIN

Introductory Note
Students should consult with the departmental Undergraduate Advisor for the latest information on course offerings. Some courses are offered in rotation.

LAT 100A F 4C 0.5
Introductory Latin 1
A course designed for students beginning the study of Latin or who have not yet reached the level expected in LAT 203/204. Although the teaching approach emphasizes exposure to simple texts as soon as possible, students desiring basic competence in reading should go on to do LAT 100B.

LAT 100B W 4C 0.5
Introductory Latin 2
Continuation of LAT 100A. The aim is to attain basic reading competence in prose.

LAT 203 F 3C 0.5
A Survey of Latin Literature 1
A general survey of Latin prose and poetry from its origins to the beginning of the Roman Empire. The literary achievement of Rome will be examined mainly through selections in Latin with occasional readings in translation.

LAT 204 W 3C 0.5
A Survey of Latin Literature 2
A general survey of Latin prose and poetry from the beginning to the fall of the Roman Empire; a continuation of LAT 203.

LAT 261 3C 0.5
Latin Prose 1
Selections from the Letters of Cicero and Pliny.

LAT 262 3C 0.5
Latin Prose 2
Selections from Livy and Suetonius.

LAT 272 3C 0.5
An Introduction to Vergil
Selections from the Works of Vergil.

LAT 281 3C 0.5
Latin Poetry 1
Selections from the lyric poems of Catullus and Horace.

LAT 282 3C 0.5
Latin Poetry 2
Selections from Ovid and Martial.

LAT 351 3C 0.5
Latin Composition and Grammar
Composition, translation and grammar with intensive analysis of selected passages.

LAT 352 3C 0.5
The History of the Latin Language
A study of the history and development of the Latin language from its origins to its evolution into the Romance languages.

LAT 361 3C 0.5
Cicero
The life and works of Cicero, his historical importance and his contribution to Latin literature. Selections from various works.

LAT 362 F 3C 0.5
Lucretius
Selections from the De Rerum Natura.

LAT 363 3C 0.5
Roman Comedy
The study in Latin of at least one play by Plautus or Terence, with supplemental readings in translation.

LAT 371 3C 0.5
Introduction to the Roman Historians
Selections from Sallust and Livy, a study of the development of Roman historiography.

LAT 372 3C 0.5
Tactitus
Selections from the works of Tacitus.

LAT 381 3C 0.5
Medieval Latin 1
Selections from the works of the fourth to the 12th centuries A.D.

LAT 382 3C 0.5
Medieval Latin 2
Selections from works of the 12th century A.D. to the Renaissance.

LAT 391 3C 0.5
Advanced Latin Reading
A reading course designed to follow the second year of Latin. By the end of the course students should be competent to read moderately difficult prose and poetic texts. Authors and teaching techniques will be chosen to fit the needs of the students.

LAT 411 2S 0.5
Latin Epigraphy
The course introduces and investigates Latin inscriptions as evidence for the Latin language and Roman political, religious, legal, social and economic history.

LAT 413 2S 0.5
Vergil 1
Selections from Aeneid 1-6.

LAT 421 2S 0.5
Vergil 2
Aeneid VII-XII (selections); readings from the Eclogues and Georgics.

LAT 461 2S 0.5
Roman Elegy
Selections from Catullus, Ovid, Propertius and Tibullus.
Combinatorics and Optimization

Undergraduate Officer
C.J. Colbourn, MC 6067, ext. 4466

Introductory Notes

1. The following courses are offered in conjunction with the Division of Mathematics for Industry and Commerce: C&O 350, 351, 367, 370, 452 and 454.

2. More detailed course descriptions and course outlines are available in the C&O Undergraduate Handbook.

C&O 220 W 3C 0.5
Introductory Combinatorics
Elementary principles of enumeration. Principle of inclusion-exclusion, generating functions, recurrence equations. Elementary graph theory and graphical algorithms. Introduction to design theory.
Pre: MATH 130B, 134B or C&O 230
Antireq: C&O 320

C&O 230 F,W,S 3C 0.5
Introduction to Combinatorics
An introduction to the combinatorics of ordinary generating functions. Introduction to basic graph theory and graphical algorithms.
Pre: MATH 130B, 134B or MATH 136, 138
Antireq: C&O 220
Also offered at St. Jerome's College in Fall Term.

C&O 270 F,W,S 3C 0.5
Introduction to Optimization
Pre: MATH 130B, 134B or MATH 111B, 113B
Students may not enrol in C&O 270 if they have previously completed, or are concurrently enrolled in, C&O 350 or 367.

C&O 330 F 3C 0.5
Combinatorial Enumeration
The combinatorics of the ordinary and exponential generating functions. Matrix methods, and decompositions. Applications to the enumeration of sequences, permutations, trees, lattice paths and partitions.
Pre: C&O 230

C&O 331 W 3C 0.5
Coding Theory
A first course in error-correcting codes. Linear block codes, Hamming-Golay codes and multiple error-correcting BCH codes are studied. Various encoding and decoding schemes are considered.
Pre: MATH 234B or PMATH 336
Offered at St. Jerome's College.

C&O 342 F,S 3C 0.5
Graph Theory 1
An introduction to the ideas, methods and applications of graph theory. Finding shortest paths and maximum matchings in weighted graphs. Determining the connectivity of a graph.
Pre: C&O 230

C&O 343 W 3C 0.5
Graph Theory 2
Pre: C&O 342

C&O 350 F,W,S 3C 0.5
Linear Programming
Pre: MATH 224A or 235
Antireq: ACTSC 335

C&O 351 F,W,S 3C 0.5
Network Flow Theory
Pre: C&O 230

C&O 357 F,W 3C 0.5
Nonlinear Programming
One-dimensional optimization. Introduction to unconstrained optimization in several variables including Newton's method, secant methods, conjugate gradient methods and the special case of quadratic forms. Introduction to constrained optimization including the elements of Kuhn-Tucker theory, active set methods and penalty function techniques.
Pre: MATH 234B or PMATH 336

C&O 340 W,S 3C 0.5
Mathematical Discovery and Invention
A course in problem solving. 100 problems are studied. Problems are taken mainly from the elementary parts of algebra, geometry, number theory, combinatorics and probability.
Pre: MATH 130B, 134A/B or MATH 135, 136, 138

Although the mathematics for this course is technically elementary, the course is intended for third and fourth-year students, and the mathematical maturity of a senior student will be assumed.
Course Descriptions
Combinatorics and Optimization

C&O 382 2C 0.5
*Combinatorial Geometry*
An introduction to the combinatorial aspects of the real plane. Main topics covered are the enumeration of various combinatorial objects in the plane, Sylvester's Theorem, partitioning the interior of a rectangle into squares of different sizes, an introduction to the theory of convex sets in the plane. Hall's theorem and certain ramifications will be explored.
Prereq: MATH 135B, 134A/B or MATH 135, 136, 138

Although the mathematics for this course is technically elementary, the course is intended for third and fourth-year students, and the mathematical maturity of a senior student will be assumed.

C&O 430 W 3C 0.5
*Algebraic Enumeration*
The course is an extension of C&O 330. The Lagrange implicit function theorem, hypergeometric series, and the ring of formal Laurent series. The combinatorics of Eulerian generating series, enumeration under the action of a group, the algebra of symmetric functions, the group algebra of the symmetric group, with applications.
Prereq: C&O 330

C&O 434 F 2C 0.5
*Combinatorial Design*
Topics covered include error correcting codes, resolvable designs, affine designs, weighing matrices, and their interaction.
Prereq: MATH 234B or PMATH 336

C&O 437 W 3C 0.5
*Cryptography and Communications Security*
Conventional or single key cryptography from the Caesar cipher to the U.S. Data Encryption Standard. Public or two key cryptography. Applications include secrecy/privacy, user or message authentication, financial transactions security.
Prereq: STAT 230. At least one of C&O 331 and PMATH 340 is recommended.

C&O 438 F 3C 0.5
*Combinatorial Computing*
A course covering a number of applications of computers to combinatorial problems. General procedures — backtracking programming, generation of permutations, partitions, etc., as well as the solution of many specific problems. Includes an introduction to computational complexity.
Prereq: C&O 230

C&O 439 2C 0.5
*Topics in Combinatorics*
An undergraduate seminar in combinatorics. The primary objective is to study current work in specific areas of combinatorics. Course content may vary from term to term.
Prereq: Consent of instructor

C&O 440 F 2C 0.5
*Topics in Graph Theory*
An in-depth study of one or two topics in graph theory. Course content may vary from term to term. Topics may include planar graphs, extremal graph theory, directed graphs, enumeration, algebraic graph theory, probabilistic graph theory, connectivity, graph embedding, colouring problems.
Prereq: C&O 342 or consent of instructor

C&O 450 F 2C 0.5
*Combinatorial Optimization*
Prereq: C&O 351

C&O 452 W 2C 0.5
*Integer Programming*
Formulation of problems as integer linear programs. Solution by branch-and-bound and cutting plane algorithms. Introduction to the theory of valid inequalities and polyhedral combinatorics.
Prereq: C&O 351

C&O 454 F,S 3C 0.5
*Scheduling*
Sequencing algorithms for scheduling tasks on single machines, parallel machines, and flow shops. Applications to scheduling computers and manufacturing facilities. Combinatorial techniques used in algorithm development and convergence proofs.
Prereq: C&O 351 or 370

C&O 456 W,S 3C 0.5
*Game Theory*
An introduction to the analysis, through appropriate mathematical models, of competitive situations such as those arising in social, economic, political or military conflict. Emphasis is placed on the theory of two-person games.
Prereq: C&O 350

C&O 458 W 3C 0.5
*Numerical Linear Programming*
Methods for the minimization and maximization of piecewise linear functions and linear functions subject to linear constraints, with applications to linear programming and data fitting. Emphasis is on algorithms, numerical considerations and software implementation, that take into account the fact that in practise many of these problems are large and sparse.
Prereq: One of CS 372, C&O 350, or CS 337 and consent of instructor. CS 374 is recommended.

C&O 459 2C 0.5
*Topics in Optimization*
An undergraduate seminar in optimization. The primary objective is to study recent work in specific areas of optimization. Course content may vary from term to term.
Prereq: Consent of instructor

C&O 464 W 2C 0.5
*Quadratic Programming*
A detailed presentation of optimality conditions and effective algorithms for the solution of a quadratic programming problem. All concepts are developed as natural extensions of their counterparts in linear programming. Applications to portfolio analysis, engineering plasticity, regression, pattern recognition.
Prereq: C&O 350

C&O 466 F 2C 0.5
*Continuous Optimization*
Prereq: C&O 350, 367

C&O 480 F 2C 0.5
*History of Mathematics 1*
An in-depth examination of the origins of modern mathematics, beginning with examples of Babylonian mathematics. Topics include Pythagorean triples, solution of equations, estimation of pi, duplication of the cube, trisection of an angle.
Prereq: MATH 130B, 133A/B or MATH 135, 138, 139

Although the mathematics for this course is technically elementary, the course is intended for third and fourth-year students, and the mathematical maturity of a senior student will be assumed.
1. The Department of Computer Science has two distinct streams of courses, one for students who have been admitted into a Computer Science Major program, and another especially designed for non-specialists who wish to become sophisticated computer users. Within this context, Computer Science Major programs include Honours Computer Science, Honours Co-op Computer Science with Electrical Engineering Electives, Honours Co-op Computer Science - Information Systems Option, and all Joint and Double Honours BMath programs involving Computer Science as one of the majors.

CS 131 and 132, required in all four-year BMath programs, are normally restricted to students in the Faculty of Mathematics. All other CS courses numbered with a middle digit of 0 through 3 are non-specialist courses. As such, they will not normally be open to Computer Science Major students, but they will be available to all other students in the University, subject to resource limitations.

Several CS Major courses are also open to other students. In addition, where resources permit, students with exceptionally high academic standing in other programs may be considered for admission to restricted CS Major courses on an individual basis. To be considered, students should consult a Computer Science Undergraduate Advisor.

2. The Computer Science Department is experiencing demand for its courses beyond available resources. Thus, accessibility to Computer Science courses cannot be guaranteed to all students. Every effort will be made to accommodate those students who preregister during published University preregistration periods. While priority will be given to those preregistrants, admission to specific courses cannot be guaranteed and course substitutions may be required to satisfy degree requirements.

3. Regular students will not normally be permitted to enroll in Computer Science courses during the Spring term. (See section 6.4 on page 13.38.)

Co-op students will not normally be permitted to enroll in Computer Science courses while on a work term.

All other part-time students, as well as full-time non-degree and post-degree students, will normally be limited to at most one Computer Science course per term from the non-specialist offerings. (Post-degree students on academic leave from their home institution should consult a Computer Science Advisor to arrange an appropriate selection of courses.) Priority for registration will normally be given to students registered full-time in a degree program.

4. Students in first and second year are limited to one Computer Science course per term. Students in CS Major programs are limited to three CS courses per term in third and fourth year. Other students are limited to two CS courses per term in third and fourth year.

5. Please note that the terms in which courses are offered may deviate from those indicated below. Students are advised to consult the University Course Offerings List published at preregistration time.

6. Students in faculties other than Mathematics should take particular note of the following courses: CS 100, 102, 212, 230, 316.

7. For the purposes of satisfying prerequisites for non-specialist courses, except where otherwise specified, the second entry in each of the following course pairings may normally be substituted for the first entry of that pairing: (CS 230 and 241) and (CS 334 and 340).

8. Students who have demonstrated exceptionally strong academic performance will be permitted to enroll in 600-level CS courses at the discretion of the instructor, if there is available capacity. Courses at the 600 level may not be used to satisfy a program requirement for minimum number of courses in Computer Science at the 400 level, but may be taken in place of additional 400-level courses.

9. The prerequisite phrase "x-year standing" means that a student must be registered in year x or higher.

10. The following courses are offered in conjunction with the Division of Mathematics for Industry and Commerce: CS 333, 334, 432, 446, 448 and 452.

11. The standard penalty for cheating will be the assignment of a grade of -100% for the assignment, test or exam in question, with a minimum deduction of 5% from the final course grade. All such incidents will also be reported to the Associate Dean (Undergraduate Studies) of the student's faculty.

CS 100 F,W,S 2C,2L 0.5

Introduction to Computer Usage

An introduction to universally applicable computer services. Hands-on experience with common software and hardware, supported by examples of applications and social implications chosen from many disciplines. Topics include: electronic mail, word processing, spreadsheets, record management, and hardware and software concepts. Antireq: CS 131, 132 CS 100 cannot be counted for credit toward a BMath Honours or four-year General degree.
Course Descriptions

Computer Science

CS 102  F,W,S  3C,2L  0.5
Introduction to Computer Programming
Fundamental techniques of algorithm design and program development. Introduction to a programming language applicable to the student's field of study. Topics include: structured programming, simple data elements, sequential operations, iterative statements, selection statements, data aggregations, functions and subroutines.
Prereq: Computer literacy (e.g. CS 100 or extensive high school computing)
Antireq: CS 131, 132

Divisions of the course will be application-oriented: CS 102 SCI is intended for students in the natural sciences and CS 102 (blank division suffix) for other students. Both divisions will not be offered each term.
CS 102 cannot be counted for credit toward a BMath Honours or four-year General degree.

CS 131  F,W,S  3C,1T,3L  0.5
Principles of Computer Science 1
An introduction to the use of computers in problem solving, including an overview of computer science, introduction to algorithms and structured programming, correctness and efficiency, file and database management, communications and networks. Labs will emphasize hands-on exposure to modern applications software and to the use and development of appropriate software tools.
Prereq: Full-time degree registration in the Faculty of Mathematics
Antireq: CS 100, 140, 180, 212, 234, 235, 240, 250

The division of CS 131 for students with little or no Computer Science background has more contact hours than indicated above, to provide additional assistance to such students.
Also offered at St. Jerome's College in the Fall term

CS 132  F,W,S  3C,1T,3L  0.5
Principles of Computer Science 2
An introduction to data representation and numerical problem solving, including an overview of programming systems and machine architectures, linked lists, hashing techniques, dynamic storage allocation, techniques for zero-finding and area-finding, solving linear equations, simulation and decidability. Labs will emphasize hands-on exposure to the use and development of appropriate software tools.
Prereq: CS 131 and full-time degree registration in the Faculty of Mathematics
Antireq: CS 100, 102, 140, 180, 212, 234, 235, 240, 250
Also offered at St. Jerome's College in the Winter term

CS 212  F,W  3C  0.5
Programming Principles and Practice
High-level languages, including their specification and translation. Structured programming. Use of data structures, including lists and trees. Recursion. Sorting. Introduction to computational complexity and correctness.
Prereq: One of CS 102, 140, or equivalent
Antireq: CS 131, 132, 234, 240, 241, 242
CS 212 cannot be counted for credit toward a BMath Honours or four-year General degree.

CS 230  F,W,S  3C  0.5
Introduction to Computers and Computer Systems
Basic computer architecture, operating system services, and programming languages in support of development of software systems.
Prereq: One of CS 132, 212
Antireq: CS 117, 235, 241, 242, 250, E&CE 222
CS 230 cannot be counted for credit in a Computer Science Major program


CS 241  F,W,S  2C,1T  0.5
Principles of Computer Science 3
The relationship between high-level languages and the computer architecture that underlies their implementation, including basic machine architecture, assemblers, specification and translation of programming languages, linkers and loaders, block-structured languages, parameter passing mechanisms, and comparison of programming languages.
Prereq: CS 132 and an all-inclusive cumulative math average of at least 60%
Antireq: CS 212, 230, 234, 235, 240, 250

CS 242  F,W,S  2C,1T  0.5
Principles of Computer Science 4
The function of modern operating systems and their relationship to the computer architecture that underlies their implementation, including file systems, I/O and interrupt handling, CPU scheduling and swapping, memory management, parallel processing. The course also includes an overview of computer networking, performance monitoring, modeling and simulation, and the social implications of computing.
Prereq: CS 241
Antireq: CS 117, 212, 230, 234, 235, 240, 250

CS 318  W  3C,1L  0.5
Introduction to Statistical Problem Solving by Computer
This is an applications oriented course which prepares the nonmathematical student to use the computer as a research tool. Topics include aids for statistical analysis and the preparation of documents such as reports and theses. The course provides sufficient background for application to other problems specific to the individual's field.
Prereq: One statistics course and computer literacy (e.g. CS 100 or high school computing), or consent of instructor
CS 318 cannot be counted for credit toward a BMath degree.
CS 330 F,W,S 3C 0.5
Management Information Systems
A study of application software systems in the business environment. Topics include data models of business functions, file and data base systems, and integrated accounting systems. Students modify an integrated accounting system and also work with selection of commercially available software systems.
Prereq: One of CS 230, 241, and third-year standing.
CS 330 cannot be counted for credit in a Computer Science Major program.

CS 334 F,S 3C 0.5
Data Types and Structures
Top-down design of data structures. Using representation-independent data types. Introduction to commonly used data types, including lists, sets, mappings, and trees. Selection of data representation.
Prereq: One of CS 230, 241 and third-year standing
Antireq: CS 340
CS 334 cannot be counted for credit in a Computer Science Major program.

CS 336 W 3C 0.5
Distributed Computer Systems
An introduction to networks and computer systems, reliable communication, layered models, distributed file systems, cryptography, concurrency issues.
Prereq: One of CS 230, 241
Antireq: CS 454
CS 336 cannot be counted for credit in a Computer Science Major program.

CS 337 W,S 3C 0.5
Introduction to Numerical Analysis
Pitfalls in computation; solution of linear algebraic equations; polynomial interpolation; least squares: numerical integration and differentiation. The intent is to expose students to the theory behind modern algorithms for solving mathematical problems.
Prereq: CS 132 or 140, MATH 134B or 136, MATH 130B or 138 MATH 235 or (MATH 230B and 234A) is recommended.
Antireq: CS 372, 374
Cross-listed as AM 341
CS 337 cannot be counted for credit in a Computer Science Major program.

CS 338 F,W,S 0.5
Computer Applications in Business: Databases
A user-oriented approach to the management of large collections of data. Methods used for the storage, selection and presentation of data. Common database management systems.
Prereq: One of CS 230, 241
Antireq: CS 448
CS 338 cannot be counted for credit in a Computer Science Major program.

CS 340 F,W,S 3C 0.5
Data Structures and Algorithms
The use of abstract data types in the design of data structures; efficiency dictionaries; sorting and priority queues. Techniques for designing efficient algorithms; application to problems on graphs; design of heuristics and approximate solutions to apparently intractable problems.
Prereq: CS 240 or 242, C&O 230, and third-year standing in a Computer Science Major program
Antireq: CS 334

CS 351 F,W,S 3C 0.5
Digital Design and Architecture
Boolean algebra. Design and analysis of both combinational and sequential circuits. Registers, counters, memory, programmable logic. CPU control logic, the arithmetic-logic unit. Input/output and interrupts.
Prereq: CS 242 and third-year standing in a Computer Science Major program
Antireq: CS 335, 350, 358, E&CE 323

CS 354 F,W 3C 0.5
Software Systems
An introduction to the system software of modern computing systems, with emphasis on the management of hardware resources and the support of multiple processes. Major topics: object-oriented programming, critical sections and synchronization, primitives for concurrency control, the deadlock problem, memory management, file systems, introduction to distributed computing.
Prereq: CS 242 and third-year standing in a Computer Science Major program.

CS 360 F,W 3C 0.5
Introduction to the Theory of Computing
Models of computers including finite automata and Turing machines. Basics of formal languages with applications to syntax of programming languages. Unsolvable problems and their relevance to the semantics of programming. Concepts of computational complexity including NP completeness.
Prereq: CS 240 or 242, C&O 230, and third year standing

CS 372 F,W,S 3C 0.5
Introduction to Scientific Computation: Numerical Linear Algebra
Pitfalls in computation. Direct solution of linear algebraic systems. Iterative solution of linear algebraic systems. Least-squares computations. Iterative solution of f(x) = 0. Minimization of functions of several variables.
Prereq: CS 132 or 140, MATH 230A or 237, MATH 234A or 235
Antireq: CS 337

CS 374 F,W,S 3C 0.5
Introduction to Scientific Computation: Numerical Approximation
Prereq: CS 132 or 140, MATH 230A or 237, MATH 234A or 235
Antireq: CS 337

CS 430 F 3C 0.5
Applications Software Engineering
An investigation into the role and function of software engineering practice in the construction of computer based systems. Topics include: requirements and specification; documentation techniques; analysis and design; implementation; testing and maintenance; management issues.
Prereq: CS 330 or permission of instructor and third-year standing
Antireq: CS 446
CS 430 cannot be counted for credit in a Computer Science Major program.
### Course Descriptions

**Computer Science**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Units</th>
<th>Title</th>
</tr>
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<tbody>
<tr>
<td><strong>CS 432 F.S. 3C 0.5</strong></td>
<td><strong>Business Systems Analysis</strong></td>
<td>Survey of organization and management theory, systems theory and the systems approach. Design, data base concepts, implementation, and evaluation of computer based information systems. Prereq: CS 330 and third-year standing. Antireq: CS 482. CS 432 cannot be counted for credit in a Computer Science Major program.</td>
</tr>
<tr>
<td><strong>CS 435 W 3C 0.5</strong></td>
<td><strong>Computer Applications</strong></td>
<td>An overview of some more advanced computer techniques, with an emphasis on their application in the analysis and design of systems. Topics include: data communication; queueing theory fundamentals; 2-D graphics; advanced software and hardware architectures; computer selection. Prereq: One of CS 334, 335, 336, and third-year standing. CS 435 cannot be counted for credit in a Computer Science Major program.</td>
</tr>
<tr>
<td><strong>CS 437 W 3C 0.5</strong></td>
<td><strong>Simulation by Computer</strong></td>
<td>An introduction to the basic techniques of simulation. Discrete simulation models; random number generators; the SIMSCRIPT and GPSS languages; analysis of simulation output; continuous simulation models and the CSMP language. Prereq: One of CS 230, 241, and third-year standing. Antireq: CS 457. CS 437 cannot be counted for credit in a Computer Science Major program.</td>
</tr>
<tr>
<td><strong>CS 442 F.S 3C 0.5</strong></td>
<td><strong>Principles of Programming Languages</strong></td>
<td>An exposure to important concepts and issues in contemporary programming languages. Data types, abstraction, and polymorphism. Program structure. Lambda calculus and functional programming, logic programming, object-oriented programming. Semantics of programming languages. Critical comparison of language features and programming methodologies using examples drawn from a variety of programming languages including Lisp, Prolog, ML, Ada, Smalltalk, Icon, APL, and Lucid. Programming assignments involve the use of some of these languages. Prereq: CS 340 and fourth-year standing in a Computer Science Major program.</td>
</tr>
<tr>
<td><strong>CS 446 F.W.S 3C 0.5</strong></td>
<td><strong>Software System Design and Implementation</strong></td>
<td>An investigation into the role and function of software engineering practice in the design and implementation of computer based systems. Topics include: structural design; procedural design; testing and reliability; management topics; programming languages and coding; portability techniques; maintenance; performance measurement and analysis. Prereq: CS 340 or 242, and fourth-year standing in a Computer Science Major program. CS 354 is recommended. Antireq: CS 430.</td>
</tr>
<tr>
<td><strong>CS 448 F.W.S 3C 0.5</strong></td>
<td><strong>Introduction to Database Management</strong></td>
<td>The course introduces the student to the techniques that have been developed for processing very large collections of data. The requirement that data be held on secondary storage (disks and tapes) has an enormous impact on the design of algorithms to access that data. Prereq: CS 340 and fourth-year standing in a Computer Science Major program. Antireq: CS 338.</td>
</tr>
<tr>
<td><strong>CS 450 W 3C 0.5</strong></td>
<td><strong>Computer Architecture</strong></td>
<td>The course is intended to provide the student with an appreciation of modern computer design and its relationship to system architecture, compiler technology and operating system functionality. The course places an emphasis on design based on the measurement of performance and its dependency on parallelism, efficiency, latency and resource utilization. Prereq: CS 351 or (CS 242 and E&amp;CE 223) or (CS 350 and CS 358) or (CS 350 and E&amp;CE 223), and fourth-year standing in a Computer Science Major program.</td>
</tr>
<tr>
<td><strong>CS 452 F.W.S 3C 0.5</strong></td>
<td><strong>Real-time Programming</strong></td>
<td>Intended to give students experience with tools and techniques of real-time programming, this course includes not only issues of microcomputer architecture and a real-time programming language and operating system, but also hands-on experience programming a microcomputer for applications such as process control, data acquisition and communication. Prereq: CS 354 and fourth-year standing in a Computer Science Major program. CS 350 or 351 is recommended.</td>
</tr>
<tr>
<td><strong>CS 454 F.W.S 3C 0.5</strong></td>
<td><strong>Distributed Systems</strong></td>
<td>An introduction to distributed systems, emphasizing the multiple levels of software in such systems. Specific topics include fundamentals of data communications, network architecture and protocols, local-area networks, concurrency control in distributed systems, recovery in distributed systems, and clock synchronization. Prereq: CS 354 and fourth-year standing in a Computer Science Major program. CS 350 or 351 is recommended. Antireq: CS 336.</td>
</tr>
<tr>
<td><strong>CS 457 W 3C 0.5</strong></td>
<td><strong>Queueing Models: Analysis, Simulation, and Computer Applications</strong></td>
<td>An introduction to the basic results of queueing theory and the techniques of discrete event simulation. Emphasis is placed on the application of queueing models to computer systems and computer communication networks. Prereq: STAT 231, 333, CS 240 or 242, and fourth-year standing in a Computer Science Major program. Antireq: CS 437.</td>
</tr>
</tbody>
</table>
CS 458 W,S 3C 0.5
Design of Microprocessor-Based Systems
An introduction to the design of digital systems such as those used in microcomputers, control and industrial applications, or those dedicated to specific tasks. Topics include: digital electronics, microprocessors, memory chips and systems, standard and specialized peripheral chips, development and integration systems, and case studies. Laboratory-oriented: small teams design and implement microprocessor-based systems.
Prereq: CS 351 or 358, and fourth-year standing in a Computer Science Major program. CS 350 is recommended for those students who do not have CS 351.

CS 462 F 3C 0.5
Formal Languages and Parsing
Prereq: CS 360 and fourth-year standing

CS 464 W 3C 0.5
Computational Complexity Theory
The classification of problems according to the computational resources required for their solution, with emphasis on properties of feasible computations rather than on specific algorithms. Topics include: time and space complexity, tractable and intractable problems, computation using randomness, parallel computation.
Prereq: CS 360 and fourth-year standing

CS 466 F,S 3C 0.5
Algorithm Design and Analysis
Design of good algorithms and analysis of the resources they consume. Lower bounds on the resource requirements of algorithms to compute certain functions. Problems from the following areas are discussed in this light: sorting and order statistics, data structures, arithmetic computations, the NP-complete problems.
Prereq: CS 340 and fourth-year standing, CS 360 is recommended.

CS 472 W 3C 0.5
Numerical Linear Algebra
Prereq: CS 372, or CS 337 and consent of instructor. CS 374 is recommended.

CS 473 W 3C 0.5
Numerical Linear Programming
Methods for the minimization and maximization of piecewise linear functions and linear functions subject to linear constraints, with applications to linear programming and data fitting. Emphasis is on algorithms, numerical considerations and software implementation.
Prereq: One of CS 372, C&O 350, or CS 337 and consent of instructor. CS 374 is recommended.
Cross-listed as C&O 459

CS 476 F 3C 0.5
Numerical Solution of Differential and Integral Equations
Prereq: CS 374, or CS 337 and consent of instructor, or CS 372 and consent of instructor
Cross-listed as AM 441

CS 482 F,W,S 3C 0.5
Techniques in Systems Analysis
Techniques in organization and management theory. Organization of large software systems. Data base concepts. Implementation of computer based information systems. Survey of current topics of interest such as distributed processing, microcomputers and on-line systems.
Prereq: CS 340 and fourth-year standing in a Computer Science Major program
Coreq: CS 448
Antireq: CS 432

CS 486 F,W,S 3C 0.5
Introduction to Artificial Intelligence
Prereq: CS 240 or 242, and fourth-year standing in a Computer Science Major program

CS 487 W 3C 0.5
Introduction to Symbolic Computation
An introduction to the use of computers for symbolic mathematical computation, involving traditional mathematical computations such as solving linear equations (exactly), analytic differentiation and integration of functions, and analytic solution of differential equations.
Prereq: CS 240 or 242, PMATH 334 or consent of instructor, and fourth-year standing

CS 488 F,W,S 3C 0.5
Introduction to Computer Graphics
Software and hardware for interactive computer graphics. Implementation of device drivers, 3-D transformations, clipping, perspective, and input routines. Data structures, hidden surface removal, color shading techniques, and some additional topics will be covered.
Prereq: CS 340, MATH 234A or 235, and fourth-year standing in a Computer Science Major program

CS 492 W 2C,iD 0.5
The Social Implications of Computers
This course is designed to consider the problems caused for organizations and society by the advent of computer technology so that constructive solutions to these problems may be discussed.
Prereq: CS 340 and fourth-year standing in a Computer Science Major program

CS 494 F,W 3C 0.5
Computers and the Law of Information Technology
An introduction to the subject of computer law, examining current legal issues and problems relating to the use of computer-based information systems, the protection of computer software and data bases, and the acquisition and sale of computer systems.
Prereq: Fourth-year standing in a Computer Science Major program
CS 498 0.5
Advanced Topics in Computer Science
See the Course Offerings List for topics available.
Prereq: Fourth-year standing in a Computer Science Major program

CS 499 0.5
Readings in Computer Science
This course cannot be used to satisfy any 400-level course requirement in a Computer Science Major program.

Croatian
For courses in Croatian see Germanic and Slavic Languages and Literatures.

Dance
Undergraduate Officer
B. Soren, ECH 1108, ext 6307

Courses not offered in the current academic year are listed at the end of this section.

DANCE 110 F 2C,2T 0.5
Introduction to Dance
An examination of theatre dance and the various professional activities which contribute to its growth. Extensive viewing of films, videos, slides and live performance as well as lectures, discussions and workshop sessions. No dance background necessary.

DANCE 111 W 2C,2std 0.5
The Elements of Dance
An examination, practical and theoretical, of the formal and thematic components of dance. Studio sessions deal with problem solving in space, dynamics and rhythm. No dance background necessary.

DANCE 230 F 2C,1std. 0.5
Roots of Western Theatre Dance
History and cultural significance of dance up to and including Fokine and Duncan.

DANCE 235 W 3C 0.5
History of 20th-Century Dance
The two major Western theatre dance forms are examined in their radically different but complementary evolutions as perceived through the work of significant choreographers. Prereq: DANCE 230 or permission of instructor

DANCE 241 F 3C,1 1/2 std 0.5
Benesh Notation 1
A theoretical and practical introduction to Benesh Movement Notation at the elementary level focusing on the reading of ballet syllabus work. Coreq: Elementary ballet or permission of instructor

DANCE 264 F 2C 1/2
Developmental Aspects of Movement
A study integrating the theoretical and applied aspects of motor and perceptual motor development in children and adolescents. Tutorials will discuss dance activities for children. Prereq: DANCE 111

DANCE 266 W 2 1/2 hr C 0.5
Principles of Dance Technique
A study of the principles underlying the Western Theatre Dance forms known as Classical Ballet and Modern Dance. Prereq: DANCE 102D Preliminary Ballet and 104D Preliminary Modern Dance, or equivalent

DANCE 336 F 3C 0.5
Dance Criticism
This course offers students a chance to enhance their abilities to write and talk about the dance experience. Examples of dance criticism from the past two centuries are used in tandem with films, videos, slides, live performance and guest lecturers to sharpen perceptions.

DANCE 341 W 3C 0.5
Benesh Notation 2
A theoretical and practical study of Benesh Movement Notation focusing on the reading and recording of ballet variations. Prereq: DANCE 241 Coreq: Elementary Ballet or permission of instructor

DANCE 353 W 2C,2std 0.5
Modern Dance Composition
This course explores major forms and theories of modern dance choreography through studio practice and seminars. Coreq: Intermediate Modern Dance or permission of instructor

DANCE 366 W 2C,2T,2std 0.5
Developmental Foundations of Dance Technique
A study of the physical development of the child between preschool and adolescence, and an integration of this knowledge to the selection and sequencing of dance technique. Prereq: DANCE 264 and KIN 200 or permission of instructor

DANCE 367 F 2C,3std 0.5
Developmental Aspects of Movement Learning
An examination of the developmental changes significant to the learning process with a particular emphasis on those factors which affect the learning of dance during childhood and early adolescence. Prereq: KIN 255

DANCE 371 W 3C 0.5
Issues in Dance and Society
An introduction to dance as a lifelong learning process. Dance-related issues in such settings as community organizations, schools, continuing education programs, cultural organizations, government, and the mass media will be explored through discussion, workshops, guest speakers and observation of ongoing programs. Prereq: Permission of instructor

DANCE 410/411 F/W 0.5/0.5
Honours Dance Major Paper
Students will examine dance research from different approaches including experimental, descriptive, historical and philosophical. Prereq: Honours Dance students only. Students must consult a faculty advisor before registering in one of the following:

DANCE 410B and

DANCE 411B Skill Learning
Prereq: DANCE 264, 366, 367, KIN 255

DANCE 410C and

DANCE 411C Socio-Cultural Issues in Dance
Prereq: DANCE 110, 371

DANCE 410D and

DANCE 411D Dance Notation
Prereq: DANCE 241, 341 and 482 or 474 (Benesh) or DANCE 242, 342 and 482 or 474 (Labanotation)

DANCE 410E and

DANCE 411E Dance History
Prereq: DANCE 230, 235 or equivalent, 333, 334 or 343
Course Descriptions
Dance
Fine and Performing Arts

DANCE 410F and
DANCE 411F Developmental Studies
with Children in Dance
Prereq: DANCE 264, 367, 484
Recommend auditing PSYCH 211

DANCE 412 W 3C 0.5
Seminar in Dance
An examination of current and major
issues in dance.
Prereq: Honours Dance students only

DANCE 474 F,W 0.5
Directed Study on Special Topics
For the student who wishes to pursue a
particular topic in depth through guided
independent research and/or reading. A
faculty member must approve a
student's project prior to registration.
This course may be repeated in subse-
tquent terms.
Prereq: Permission of instructor

DANCE 480 F,W wkshp 0.5
Workshop Series
The following courses are designed to
give the student an opportunity to take
theoretical knowledge to the applied
setting. Offerings each year are deter-
mined by student interests. Topics
available include:

DANCE 481 Ballet Choreography
Prereq: DANCE 351 and Elementary
Ballet
Coreq: Intermediate Ballet

DANCE 482 Dance Notation Recon-
struction
Prereq: DANCE 341 or 342

DANCE 483 Modern Dance Composi-
tion
Prereq: DANCE 353 and Interme-
diate Modern Dance
Coreq: Advanced Modern Dance

DANCE 484 Developmental Consider-
ation of Applied Movement with Chil-
dren and Adolescents
Prereq: DANCE 264 or permission of
instructor

DANCE 486 Dance Criticism
Prereq: DANCE 336, 235, 333

DANCE 488 Dance Production
Prereq: DANCE 351 or 353

The Workshop series is open only to
third- and fourth-year Dance students.
Two workshops in the 480 series may
be taken toward the Honours degree.
Workshops are offered pending suf-
cient enrolment.

Technique Courses
Entrance to Technique Courses is by
audition only. Students are placed
according to their year of enrolment,
and their level of technique. Sections
are as follows:

A Advanced
B Intermediate
C Elementary
D Pre-Elementary

For example, DANCE 301A is Year
Three Advanced Ballet 1.
Auditions are held in April and
September. Consult the Dance Depart-
ment for time and location.
Students are advised to check with
their home department regarding the
acceptability of Technique Courses for
credit. Each of the following courses
consists of two 1 1/2 hour classes per
week. Credit 0.25.

DANCE 101A,B,C,D
Year One Ballet 1 F

DANCE 102A,B,C,D
Year One Ballet 2 W

DANCE 103A,B,C,D
Year One Modern Dance 1 F

DANCE 104A,B,C,D
Year One Modern Dance 2 W

DANCE 201A,B,C,D
Year Two Ballet 1 F

DANCE 202A,B,C,D
Year Two Ballet 2 W

DANCE 203A,B,C,D
Year Two Modern Dance 1 F

DANCE 204A,B,C,D
Year Two Modern Dance 2 W

DANCE 301A,B,C
Year Three Ballet 1 F

DANCE 302A,B,C
Year Three Ballet 2 W

DANCE 303A,B,C
Year Three Modern
Dance 1 F

DANCE 304A,B,C
Year Three Modern
Dance 2 W

DANCE 401A,B
Year Four Ballet 1 F

DANCE 402A,B
Year Four Ballet 2 W

DANCE 403A,B
Year Four Modern Dance 1 F

DANCE 404A,B
Year Four Modern
Dance 2 W

COURSES NOT OFFERED 1991-92
DANCE 200 Special Studies in
Dance 1
DANCE 242 Labanotation 1
DANCE 300 Special Studies in
Dance 2
DANCE 342 Labanotation 2
DANCE 343 An Historical Survey of
Dance Notation Systems
DANCE 351 Ballet Choreography
DANCE 484 Developmental Consider-
ation of Applied Movement with Chil-
dren and Adolescents

Fine and
Performing Arts

The University offers courses in:

Dance see page 16:42

Drama and Theatre Arts see page 16:44

Fine Arts see page 16:67

Music see page 16:103

For program information please see
Chapter 8, Faculty of Applied Health
Sciences, and Chapter 9, Faculty of Arts
Drama and Theatre Arts

Undergraduate Officer
M.G. van Dijk, ML 129, ext. 3672

Courses not offered in the current academic year are listed at the end of this section.

Introductory Note
Laboratory sessions and rehearsal periods may be added to any course at the discretion of the instructor.

DRAMA 101 A F 3C 0.5
Introduction to the Theatre 1
Introductory study of the theatre as a major art form. Selected plays as produced in their historical contexts. Contributions of the actor, designer and technician to theatrical production.

DRAMA 101 B W 3C 0.5
Introduction to the Theatre 2
An extension of the studies described in 101A.

DRAMA 102 F,W 4L 0.5
Introduction to Acting.
An introduction to acting. The class will be structured as a rehearsal, where the students will explore improvisation and text work, concentrating on the practical problems of an actor's experiences in creating a role.

Coreq: DRAMA 101A or B
Limited Enrolment. Permission required.

DRAMA 221 F 6L 0.5
Intermediate Acting 1
An extension of Drama 102. This course stresses development of the actor through scene study.

Prereq: DRAMA 101A or 101B, 102 Audition required

DRAMA 222 W 6L 0.5
Intermediate Acting 2
An extension of Drama 221.

Prereq: DRAMA 221 Audition required

DRAMA 223 F,W,S 4L 0.5
Public Speaking
Theory and practice of public speaking. A workshop course involving design and delivery of various kinds of speeches, and the development of organizational, vocal, listening and critical skills. Students will be videotaped.

Prereq: None
Open to students in all faculties but limited enrolment. Must attend first class.

DRAMA 224 F,W,S 3L 0.5
Interpersonal Communication
Focuses on the one-to-one, face-to-face communication in both the personal and professional realms. Such topics as verbal and non-verbal interactions, listening, and the better management of interpersonal communication will be studied.

Prereq: DRAMA 223

DRAMA 225 F 3L 0.5
Survey of Dramatic Literature and Dramatic Theory 1
The Greek and Roman periods.
Cross-listed as CLAS 266

DRAMA 226 W 3L 0.5
Survey of Dramatic Literature and Dramatic Theory 2
The Elizabethans and Jacobean, and the Elizabethan Age.
Cross-listed as ENGL 233A

DRAMA 227 F 3L 0.5
Survey of Dramatic Literature and Theory 3
French neo-classicism, the Restoration period and sentimental drama.
Cross-listed as ENGL 233B

DRAMA 228 W 3L 0.5
Survey of Dramatic Literature and Theory 4
The late 18th and 19th centuries; romanticism and naturalism.
Cross-listed as ENGL 233C

DRAMA 229 3C 0.5
Masterpieces of Western Drama -- A Study of Performance 1
Plays on film. This course will entail studying a play and then viewing it as a movie.

DRAMA 301 F 3C 0.5
Script Interpretation 1
Advanced study and analysis of plays in the processes of production covering selected periods and types of playwrighting. May include production case-book.

DRAMA 302 W 3C 0.5
Script Interpretation 2
An extension of the studies described above in 301.

DRAMA 306 A/B/C F std 0.5
Special Studies in Theatre Production 1
Production participation and the study of selected problems of theatrical production.

Prereq: Permission of the play director

DRAMA 307 A/B/C W std 0.5
Special Studies in Theatre Production 2
See Drama 306.

Prereq: Permission of the play director

DRAMA 311 3C 0.5
Survey of Dramatic Literature and Theory 2
The Middle Ages, the Elizabethans and Jacobean (excluding Shakespeare), and the Spanish Golden Age.
Cross-listed as ENGL 232

DRAMA 312 3C 0.5
Survey of Dramatic Literature and Theory 3
French neo-classicism, the Restoration period and sentimental drama.
Cross-listed as ENGL 233A

DRAMA 313 3C 0.5
Survey of Dramatic Literature and Theory 4
The late 18th and 19th centuries; romanticism and naturalism.
Cross-listed as ENGL 233B

DRAMA 314 3C 0.5
Survey of Dramatic Literature and Theory 5
The first part of the 20th century.
Cross-listed as ENGL 233C

DRAMA 315 3C 0.5
Survey of Dramatic Literature and Theory 6
The second part of the 20th century.
Cross-listed as ENGL 233D
Power, range, flexibility and variety in voice. 

An extension of the studies described in DRAMA 321, designed to increase vocal technique and presentations.

Conflict resolution will be studied and implemented in small group meetings. 

The analysis, writing and performance of speeches. Analysis will focus on the theory of communication and speech models for imitation; writing, on in-class workshops; and performance, on student evaluation of speeches.

A workshop course which works from theory to develop the skills to work in groups effectively. The principles of group dynamics, leadership, and conflict resolution will be studied and implemented in small group meetings and presentations.

A workshop course in voice for the speaker, designed to increase vocal power, range, flexibility and variety in presenting the spoken word.

An extension of the studies described in DRAMA 326.

A workshop course which works from theory to develop the skills to work in groups effectively. The principles of group dynamics, leadership, and conflict resolution will be studied and implemented in small group meetings and presentations.
Course Descriptions
Dutch
Earth Sciences

**Dutch**

For courses in Dutch see Germanic and Slavic Languages and Literatures.

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**Earth Sciences**

**Undergraduate Officers**
E.C. Appleyard, ESC 233, ext. 3232  
S. Schiff, PHY 222A, ext. 2473

**Introductory Notes**

1. EARTH 121/122 or GEO E 126 is normally regarded as a prerequisite for any Major program in Earth Sciences.

2. Second- third- and fourth-year courses may involve field trips in the fall. All those enrolled in Honours Earth Sciences programs are required to take a two-week field camp at the end of the third year (EARTH 390). The cost will range from $120-$150 per student.

3. Regular Earth Sciences students are encouraged to seek geological employment in the summers.

**EARTH 121 F 3C 0.5**

**The Planet We Live On**

This course will be given in two parts:

1. Planet Earth: Structure of the Earth including plate tectonics, earthquakes, and volcanoes.

2. A Home for Mankind: Natural processes operating on the Earth, e.g. mass wasting, permafrost, erosion, rivers, oceans.

Coreq: for Science students  
Antireq: GEO E 126, EARTH 126

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**EARTH 122 W 3C 0.5**

**The Planet We Live Off**

This course will be given in three parts:

1. A Planet for the Taking: Minerals and non-renewable Earth resources and their exploitation.

2. The Planet Strikes Back: Natural hazards and global change.

3. Future Planet Earth: Primary considerations for survival: water, food and energy supplies, soil loss, waste disposal.

Coreq: EARTH 121 or permission of instructor  
Antireq: GEO E 126, EARTH 126

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**EARTH 122L F 3L 0.25**

Introductory Earth Sciences Laboratory 1

For students taking EARTH 121. Laboratory exercises on selected topics from EARTH 121 lectures.

**EARTH 122L W 3L 0.25**

Introductory Earth Sciences Laboratory 2

For students taking EARTH 122. Laboratory exercises on selected topics from EARTH 122 lectures.

**EARTH 123 F 3C,1T 0.5**

**Introductory Hydrology**

Introduction to components of the hydrologic cycle, the interaction of these components and their relevance to current environmental concerns. Particular consideration will be given to geologic factors as they influence precipitation, surface runoff, urban runoff, streamflow generation, soil moisture, groundwater and surface water-groundwater interactions.

**EARTH 126 W 2C,3L 0.5**

**Geological Engineering Concepts**

An introduction to physical geology and earth processes. Geological time, introduction to earth, air and water processes including vulcanism, sedimentation, weathering, lithification, continental drift, radioactive dating, hydrogeology, pedology, resources, mass wasting, erosion.

*Cross-listed as GEO E 126*
Course Descriptions
Earth Sciences

EARTH 221 W,S 3C,1T 0.5
Geochemistry
Prereq: EARTH 231 or permission of instructor

EARTH 231 F 2C,3L 0.5
Mineralogy
Introduction to systematic mineralogy. Bases of mineral classification. Interrelationships of chemical, structural and physical properties. Occurrence of major groups of rock-forming minerals. Introduction to optical properties of minerals and the use of the petrographic microscope as a tool in identifying minerals and interpreting their genetic history.
Prereq: EARTH 212

EARTH 232 W,S 2C,3L 0.5
Petrography
The study of rocks in thin section. The classification and identification of sedimentary, igneous, and metamorphic rocks.
Prereq: EARTH 231

EARTH 235 F 2C,3L 0.5
Stratigraphy
An introduction to the nature, origin and interpretation of stratified earth materials. Emphasis on principles and approaches.
Prereq: EARTH 212/212

EARTH 236 F 2C,3L 0.5
Principles of Paleontology
The principles of paleontology with particular stress on the species concept and evolution; examples will be drawn primarily from the fossil record of plants and vertebrates. Laboratory work will include projects related to lecture topics.
Prereq: EARTH 212/212

EARTH 238 W,S 3C,3L 0.5
Introductory Structural Geology
Major structural features of the earth. Concepts of stress and strain; elementary rock mechanics. The deformation of earth materials, continuous and discontinuous structures. Introduction to regional tectonics as applied to structures.
Prereq: EARTH 212/212

EARTH 260 F 3C,2L 0.5
Applied Geophysics 1
An introduction to seismic, gravity, electromagnetic and magnetic methods of exploration geophysics.
Prereq: PHYS 111/112 or PHYS 121/122 or consent of instructor

EARTH 331 F 2C,3L 0.5
Igneous Petrology
The principles and theories of igneous rock genesis. Silicate phase equilibria in magmatic systems. Magmatic differentiation; distribution and occurrence of magma types.
Prereq: EARTH 231, 232

EARTH 332 W 2C,3L 0.5
Metamorphic Petrology
Prereq: EARTH 232

EARTH 333 W 2C,3L 0.5
Introductory Sedimentology
The origin, transport and deposition of sediments. Size analysis and sedimentary structures. Recent sedimentary environments as a key to the interpretation of ancient sediments. Sedimentary petrology.
Prereq: EARTH 232, 235

EARTH 336 F 2C,3L 0.5
Paleontology
Advanced paleontology emphasizing morphologic, classification, evolution, paleoecology and stratigraphic value of fossil invertebrates. Laboratory study of fossil collections.
Prereq: EARTH 236

EARTH 342 F 2C,3L 0.5
Applied Geomorphology
Prereq: EARTH 121/122 or GEO E 126
Antireq: GEOG 201

EARTH 345 W 2C,2L 0.5
Historical Geology
A systematic review of the geological history of North America from the Precambrian to the Recent exemplified by regional geology. Laboratory work will include study of maps and cross sections.
Prereq: EARTH 235

EARTH 355 F 3C 0.5
Statistical Methods in Geology
Introduction to the principles of probability and statistics and their application in the earth sciences. Evaluation of quantitative data; statistical models.
Prereq: CS 100 or equivalent computing experience
Antireq: STAT 202, 204, 220 or 221, CIV E 224, ME 202, SY DE 214, SY DE 213

EARTH 358 W 3C,1T 0.5
Environmental Geology for Earth Scientists
The influence of geology on the natural environment with special emphasis on hazards and the role of groundwater; hydrogeology in the runoff cycle; groundwater resources development and subsurface waste disposal; environmental geology as a factor in health and disease.
Prereq: EARTH 121/122 or GEO E 126
Antireq: SCI 250

EARTH 359 W 3C,1T 0.5
Flow Through Porous Media
Quantitative introduction to the physical principles that govern the flow of fluids through porous and fractured geologic materials. Physical properties of fluids and porous media will be presented and conservation, flux and state equations will be developed. Physics of slow of immiscible fluids, including air-water and oil-water combinations will be included.

EARTH 368 F 2C 0.5
Geophysics 1
Prereq: MATH 113A/B, PHYS 121/122 or equivalent. Math 216 is recommended
Cross-listed as PHYS 368
EARTH 369 W 3C 0.5  
Geophysics 2  
Topics in physical oceanography,  
Physical properties of ocean water,  
Heat budget of the world oceans,  
Oceanic circulations, Coriolis effects,  
Some idealized current regimes.  
Prereq: MATH 113A/B, PHYS 121/122 or equivalent. Math 216 is recommended  
Cross-listed as PHYS 369

EARTH 370 W 3C,2L 0.5  
Earth Resources  
Diverse exploitable resources: metals, rocks, fuels, soils, and water, and their use by civilizations. Geology and occurrence of resources in the earth; concentration and exploitation. Impact of alternatives on society and environment. Laboratory involves geological applications, sampling methods, and ore mineral suites from mines and quarries.  
Prereq: EARTH 231, 232

EARTH 390 W field  
Methods in Geological Mapping  
Ten day field camp at Whitefish Falls, held at the end of the winter term.

EARTH 421 F 2C,3L 0.5  
Geochemistry 2  
The application of chemical thermodynamics to geochemical problems. Development of the three laws of Thermodynamics; Gibbs free energy and equilibrium constants. Introduction to various topics in aqueous geochemistry such as mineral equilibria, ion exchange and redox equilibria. Laboratory session will involve various experiments related to mineral solubility, chemical kinetics, acid-base equilibria and chemical modelling.  
Prereq: First year chemistry, EARTH 221  
Restricted to fourth-year and graduate students.

EARTH 427 W 2C,3S 0.5  
Crustal Evolution  
The application of geological knowledge and reasoning to significant contemporary earth science problems including that of global tectonics and global change.  
Normally restricted to fourth-year Earth Sciences students.

EARTH 432 F 3C,2S 0.5  
Precambrian Geology  
The geology, tectonics, stratigraphy and history of the Canadian Precambrian Shield. The early evolution of the Earth's crust. The Precambrian time scale and problems of geochronology. Life, climate and physical conditions in Precambrian time.

EARTH 433 W 2C,3L 0.5  
Applied Sedimentology  
The source, migration and sedimentary environment of hydrocarbons, exploration, types of traps, extraction. Carbonate sediments and their diagenesis. The environmental impact and control of recent sedimentation.  
Prereq: EARTH 333

EARTH 434 W 2C,3S 0.5  
Biostratigraphy  
Methods of using paleontological data to solve stratigraphic problems. Faunal provinces in space and time. Effects of continental drift and climatic change on biogeography through the Phanerozoic.  
Prereq: EARTH 336

EARTH 435 W 3C,2L 0.5  
Advanced Structural Geology  
The geometry, kinematics and dynamics of structural geology. The relationships of structures from the microscopic to the megascopic scale; statistical studies of structural elements.  
Prereq: EARTH 260

EARTH 436A/B F/W 6L 0.5/0.5  
Honours Thesis  
(A course for Honours Earth Sciences students only.)  
Each student will work under the direction of a member of the Department on a short research project. The results of this will be presented in thesis form and will be critically examined by members of this and, where pertinent, other departments.

EARTH 437 F 2C,3L 0.5  
Rock Mechanics  
Review of basic concepts in soil and rock mechanics. Foundation and rock slopes. Laboratory exercises will deal with uniaxial, triaxial, fissure, hardness and tensile testing of rock. Problem sets will be assigned.  
Prereq: A course in Statics and Mechanics of deformable materials or consent of instructor

EARTH 438 W 2C,3wkshp 0.5  
Engineering Geology  
Review of basic concepts in soil and rock mechanics. Field and laboratory methods used to define and characterize the properties of geological materials and their use in selected engineering geologic design and construction problems. Laboratory assignments will focus on the determination of physical properties and site assessment problems.

EARTH 440 F 2C,3L 0.5  
Quaternary Geology  
Stratigraphy and history of the Quaternary Period with emphasis on glaciation. Laboratory studies on glacial deposits. Field trips. A previous course in geomorphology is recommended. Not to be taken by third-year Earth Sciences students.

EARTH 441 W 2C,3L 0.5  
Introductory Quaternary Ecology  
An introduction to Quaternary ecology. The morphology, biostratigraphy, distribution and palaeoecological significance of major plant and animal groups in the Quaternary sciences. Relationships of fossil assemblages to modern ecosystems. Students will be expected to arrange with the instructors a field trip in the preceding term.  
Prereq: EARTH 440 or consent of instructors

EARTH 456 F 3C 0.5  
Numerical Methods in Geoscience  
Prereq: MATH 113A/B and an introductory course in computer programming

EARTH 458 F,S 3C,1T 0.5  
Physical Hydrogeology  
An introduction to physical hydrogeology, including Darcy's law, the groundwater flow equations for steady-state and transient conditions, applications to flow nets, aquifer testing, groundwater resources evaluation, and construction-project dewatering. The role of groundwater in the hydrologic cycle is explored with emphasis on natural groundwater flow systems and their influence on stream flow, slope stability and soil drainage. Physical processes controlling groundwater contamination are introduced.  
Prereq: EARTH 121/122 or GEO E 126 or CIV E 253. MATH 213A/B or equivalents are recommended. (Formerly EARTH 439)
Course Descriptions
Earth Sciences
East Asian Studies

EARTH 459 W 3C,1T 0.5
Chemical Hydrogeology
An introduction to the chemical side of hydrogeology with emphasis on groundwater quality and contaminants in the groundwater zone, the geochemical origin of major ions in natural groundwater, causes of hardness, groundwater age determination using isotopes, common causes of groundwater contamination; processes governing contaminant behaviour including dispersion, diffusion and adsorption, hydrogeological aspects of site selection for waste disposal.
Prereq: EARTH 260 or CIV E 375 and EARTH 231 or permission of the instructor, and EARTH 459 (Formerly EARTH 439)

EARTH 460 W 3C,1T 0.5
Applied Geophysics 2
A detailed examination of selected topics in exploration geophysics, with an emphasis on data processing, time series analysis and computer modelling of geophysical responses.
Prereq: EARTH 260
Recommended: MATH 213A and an introductory course in computer programming.

EARTH 461 F 2C,1T,3L 0.5
Applied Geophysics 3
A field oriented course emphasizing current methodology in environmental geophysics, including waste management and hydrogeological applications.
Prereq: EARTH 260

EARTH 470 F 3C,2L 0.5
Metallic Mineral Deposits
The petrology and genesis of metalliferous ore deposits. The description of classic deposits; the stability of ore minerals; ore minerals in aqueous systems. The laboratory will include instruction and practice in ore microscopy.
Prereq: EARTH 370

EARTH 490 F fidlab 0.0
Field Course
One or more geology field trips normally conducted at the beginning of the Fall term. These trips will emphasize field observations of a wide-ranging nature; some trips will augment field observations with study of specimens, core laboratory data, etc. Field exercises and reports may be part of the requirements. Enrolment limits will apply to all trips.
Honours Earth Sciences students are required to attend at least one of these trips. Open to other students only if places are available.
Field trip fees will apply; listing of current trips and respective costs available from department office.

East Asian Studies

Director
P. Swann, Renison College, 884-4400

Students who are interested in the Chinese and Japanese language courses should be aware that the completion of at least three courses in a subject is recommended for a minimum working knowledge of the language. The East Asian Culture course is a good preparation for students intending to spend time in the Far East.

EASIA 201R F,W 3C 0.5
East Asian Culture
An introductory survey of the cultures of East Asia with particular reference to China, Japan and Korea.
Open to all students above first year

CHINA 101R F,W 3C 0.5
First Year Chinese 1
An introductory course for students who have no knowledge of Chinese to develop basic listening, speaking, reading, and writing skills. Practical oral and written exercises are used to provide a firm grammatical foundation for further study. The pronunciation used is the Mandarin (Pu-tung-hua) dialect.

CHINA 102R F,W 3C 0.5
First Year Chinese 2
With the completion of the study of the rudiments of phonetics (as provided in CHINA 101R), the emphasis in this course will shift to Mandarin Chinese tonality. Six types of questions and four kinds of simple sentences will be introduced. Vocabulary will be expanded to 500 to 700 words.
Prereq: CHINA 101R

CHINA 201R 3C 0.5
Second Year Chinese 1
This course and its follow-up (CHINA 202R) will include a survey of grammar, complex sentences, logical stress, etc. Some study of Chinese Culture is included.
Prereq: CHINA 102R

CHINA 202R 3C 0.5
Second Year Chinese 2
The study of Chinese characters will receive more emphasis. Grammar instruction will include four types of comparison, different kinds of complements and complex sentences - pauses, logical stress, etc. Some study of Chinese Culture is included.
Prereq: CHINA 201R

Upon completion of CHINA 201R and 202R, the student should have a reading vocabulary of 1,000 to 1,500 Chinese characters and a writing vocabulary of 700 to 1,000 characters.

JAPAN 101R F,W,S 3C 0.5
First Year Japanese 1
An introductory course for students who have little or no knowledge of Japanese to develop basic listening, speaking, reading, and writing skills. Practical oral and written exercises incorporating the Hiragana Writing System are used to provide a firm grammatical foundation for further study.

JAPAN 102R F,W 3C 0.5
First Year Japanese 2
Listening, speaking, reading, and writing skills acquired in JAPAN 101R are further developed. Practical oral and written exercises incorporating the Katakana Writing System will be used to develop a more solid grammatical base.
Prereq: JAPAN 101R or consent of instructor

EARTH 490 F fidlab 0.0
Field Course
One or more geology field trips normally conducted at the beginning of the Fall term. These trips will emphasize field observations of a wide-ranging nature; some trips will augment field observations with study of specimens, core laboratory data, etc. Field exercises and reports may be part of the requirements. Enrolment limits will apply to all trips.
Honours Earth Sciences students are required to attend at least one of these trips. Open to other students only if places are available.
Field trip fees will apply; listing of current trips and respective costs available from department office.

EAST ASIAN STUDIES
Course Descriptions

East Asian Studies

Director
P. Swann, Renison College, 884-4400

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EASIA 201R F,W 3C 0.5
East Asian Culture
An introductory survey of the cultures of East Asia with particular reference to China, Japan and Korea.
Open to all students above first year

CHINA 101R F,W 3C 0.5
First Year Chinese 1
An introductory course for students who have no knowledge of Chinese to develop basic listening, speaking, reading, and writing skills. Practical oral and written exercises are used to provide a firm grammatical foundation for further study. The pronunciation used is the Mandarin (Pu-tung-hua) dialect.

CHINA 102R F,W 3C 0.5
First Year Chinese 2
With the completion of the study of the rudiments of phonetics (as provided in CHINA 101R), the emphasis in this course will shift to Mandarin Chinese tonality. Six types of questions and four kinds of simple sentences will be introduced. Vocabulary will be expanded to 500 to 700 words.
Prereq: CHINA 101R

CHINA 201R 3C 0.5
Second Year Chinese 1
This course and its follow-up (CHINA 202R) will include a survey of grammar, complex sentences, logical stress, etc. Some study of Chinese Culture is included.
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CHINA 202R 3C 0.5
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The study of Chinese characters will receive more emphasis. Grammar instruction will include four types of comparison, different kinds of complements and complex sentences - pauses, logical stress, etc. Some study of Chinese Culture is included.
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Upon completion of CHINA 201R and 202R, the student should have a reading vocabulary of 1,000 to 1,500 Chinese characters and a writing vocabulary of 700 to 1,000 characters.

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JAPAN 102R F,W 3C 0.5
First Year Japanese 2
Listening, speaking, reading, and writing skills acquired in JAPAN 101R are further developed. Practical oral and written exercises incorporating the Katakana Writing System will be used to develop a more solid grammatical base.
Prereq: JAPAN 101R or consent of instructor
Economics

Undergraduate Officer
E.W. Lau, HH 219, ext. 2636

Courses not offered in the current academic year are listed at the end of this section.

Introductory Notes

1. Some Economics courses do not have a "term offered" indicated. This information will be available at preregistration and students can confirm the "term offered" with their Departmental advisor.

2. The "normal" number of lectures per week in each course is three; however, each instructor determines how often his or her particular class will meet.

3. Additional ECON courses may be offered in the Spring term from time to time. Consult departmental listing at time of preregistration.

4. Due to sabbatical leaves, some courses normally offered may be cancelled in 1991-92. Consult departmental listing at time of preregistration for deletions or additional course offerings.

ECON 101 F.W.S 3C 0.5
Introduction to Microeconomics
An introduction to the central economic problems of society, the functioning of a mixed enterprise system, the economic role of government, the composition of and pricing of national output, pricing of productive factors, and income distribution.
Prereq: "M" sections only: Grade 13 or OAC calculus. When appropriate, calculus and algebra will be used in "M" sections.

ECON 102 F.W.S 3C 0.5
Introduction to Macroeconomics
An introduction to the determination of national income, unemployment (and inflation), interest rates, the exchange rate, monetary and fiscal policy.
Prereq: "M" sections only: Grade 13 or OAC calculus. When appropriate, calculus and algebra will be used in "M" sections.

ECON 201 F.W.S 3C 0.5
Microeconomic Theory
Theory of consumer choice, the economics of production; price and output under perfect and imperfect competition; pricing of inputs.
Prereq: ECON 101

ECON 202 F.W.S 3C 0.5
Macroeconomic Theory
Theory of the determination of the level of national income (GDP); the unemployment rate; interest rates; prices and inflation; analysis of macroeconomic policies to stabilize the economy and alleviate the problems of inflation and unemployment.
Prereq: ECON 101 and 102

ECON 211 F.W.S 3C 0.5
Introduction to Mathematical Economics
Application of mathematics to problems in economic theory. Topics include an introduction to matrix algebra, differentiation, partial derivatives, optimization techniques including constrained optimization — all developed within the context of economic theory.
Prereq: ECON 101, 102
Students who have not taken OAC calculus are strongly advised to take MATH 104.
Students who have taken or are taking a course in mathematics should check with their Undergraduate Officer to determine if credit will be granted for both courses.

Students should complete ECON 211 before taking third-year level Honours ECON courses.

ECON 221 F.W.S 3C 0.5
Statistics for Economists
An introduction to statistical procedures commonly employed by economists. Topics include descriptive statistics, probability distributions, sampling, statistical estimation, hypothesis testing, and simple regression analysis.
Prereq: ECON 101, 102
Students who have taken or are taking a course of similar content in another discipline should check with their Undergraduate Officer or the Arts Registrar's Office to determine if credit will be granted for both courses.

ECON 231 F,W 3C 0.5
Introduction to International Economics
Theory of comparative advantage and the gains from trade; tariff theory; concepts and measurement of balance of payments; exchange rate systems; reform of international monetary system.
Prereq: ECON 101, 102
Course Descriptions
Economics

ECON 301 F,W 3C 0.5
Intermediate Microeconomics
General equilibrium theory; theory of modern welfare economics with some applications. Intertemporal Choice.
Prereq: ECON 201, 202

ECON 302 F,W 3C 0.5
Monetary Theory and Banking
Monetary theory and banking in an open economy; national policies for achieving full employment, price stability, and equilibrium in the balance of payments.
Prereq: ECON 201, 202, 231

ECON 310 F 3C 0.5
History of Canadian Economic Development
A study of the economic development of Canada; development theories, industrial structure and national policies analysed in a classical-Marxian framework.
Prereq: ECON 101, 102
Formerly ECON 263

ECON 311 F,W 3C 0.5
Mathematical Economics
Mathematical treatment of partial and general equilibrium models. Topics usually include some of the following: duality, applications of the envelope theorem, discussion of sufficiency conditions for optimisation problems, programming, and growth models.
Prereq: ECON 201, 202, 211 (or MATH 130B/138)
Strongly recommended for students who intend to do graduate work in Economics.
Students who have taken or are taking a course of similar content in the Faculty of Mathematics should check with their Undergraduate Officer to determine if credit will be granted for both courses.

ECON 321 W,S 3C 0.5
Introduction to Econometrics
An introductory course in the theory and practice of econometrics, focusing on multiple regression and associated topics, e.g. multicollinearity, heteroscedasticity, serial correlation, errors in variables, etc. Computer assignments would be part of the course.
Prereq: ECON 221
Students who have taken or are taking a course of similar content in the Faculty of Mathematics should check with their Undergraduate Officer to determine if credit will be granted for both courses.

ECON 331 F,W 3C 0.5
International Trade
An examination of theories of international trade at an intermediate level. Topics include the gains from trade, theories of trade determination (Ricardian, Heckscher-Ohlin, increasing returns to scale), the effects of tariffs, the gains from trade, multinational corporation behaviour and factor mobility.
Prereq: ECON 201, 231

ECON 332 3C 0.5
International Finance
An analysis of the main issues in international finance. Topics include international borrowing and lending, intertemporal gains from trade, current account and balance of trade movements, the determination of exchange rates and foreign exchange markets.
Prereq: ECON 201, 202

ECON 333 W 3C 0.5
Interregional Economics
An economic analysis of regional developments: theories and policies, with special reference to Canada.
Prereq: ECON 201, 231

ECON 335 W 3C 0.5
Economic Development
The nature of the problem of economic development; theories of economic development; major policy issues in economic development.
Prereq: ECON 201, 202, 231

ECON 341 F,W 3C 0.5
Public Finance
The economic rationale of government fiscal activity; the structure and economic effects of public expenditures and revenues; the analysis of income, consumption and wealth taxes.
Prereq: ECON 102, 201

ECON 343 F 3C 0.5
Urban Economics
Application of economic analysis to urban and metropolitan areas. Topics include location decisions of households and firms, structure and growth of cities, land and housing market, urban transportation market, urban labour market, and urban public finance - all developed within the context of economic theory. Policy issues will be stressed.
Prereq: ECON 101 (ECON 201 is recommended)

ECON 344 F 3C 0.5
Consumer Theory
Economic principles for consumer analysis; market responsiveness; conditions causing problems: public and private consumption; alternative economic policies.
Prereq: ECON 201

ECON 345 W 3C 0.5
Industrial Organization
An economic analysis of market structure, behaviour and performance with special reference to the Canadian manufacturing sector.
Prereq: ECON 201

ECON 351 W 3C 0.5
Labour Economics
A study of the supply of labour by individuals and the demand for labour by firms; investment in human capital; trade unions; internal labour markets.
Prereq: ECON 201

ECON 355 W 3C 0.5
Economics of Energy and Natural Resources
An analysis of the economics of conservation, especially the adequacy of the market mechanism as an allocator of resource use over time. Issues concerning the economic behaviour of Canada's fishery, forest, fuel and nonfuel mineral industries will be considered.
Prereq: ECON 201

ECON 361 F,W,S 3C 0.5
Cost-benefit Analysis and Project Evaluation
Methods for evaluating private and public projects; decision rules, efficiency conditions and methods of conducting cost-benefit analysis. Application of the technique.
Prereq: ECON 201
Formerly ECON 241

ECON 363 W 3C 0.5
Contemporary Canadian Problems
A "topic oriented" seminar course. Problems are selected from a list that includes regulatory economics, poverty, unemployment, industrial policy, safety and other. The format assists the student in gaining analytical skill through work on the selected topics.
Prereq: ECON 201, 202
ECON 365 W 3C 0.5
Economic Development of Modern Europe 1780-1973
Prereq: ECON 101, 102

ECON 381-389 3S each 0.5
Special Topics
One or more special half courses will be offered at different times as announced by the Department.
Prereq: Consent of instructor

ECON 401 F,W 3C 0.5
Advanced Microeconomic Theory
This course considers a number of advanced topics at the forefront on modern microeconomics. Possible Topics: Uncertainty, equilibrium analysis, market structures.
Prereq: ECON 211 or equivalent, 301 (311 is recommended)
Preference for admission will be given to fourth-year Honours Economics students. Consent of the instructor or Undergraduate Officer required for other students.

ECON 402 W,S 3C 0.5
Advanced Macroeconomic Theory
Classical, Keynesian, Monetarist and New Classical models of macroeconomics; recent contributions to the theory of consumption, investment, inflation, inflation expectations, unemployment and economic growth.
Prereq: ECON 211 or equivalent, 221, 301, 302 and permission of the instructor or Undergraduate Officer for all students who are not registered in the fourth year of an Honours Economics program

ECON 403 W 3C 0.5
Economic Analysis, Forecasting, and Public Policy
The course focuses on the problems of forecasting economic activity (as measured by the principal macroeconomic variables), and of designing and implementing policies to control those variables; topics covered include a critical review of current forecasting models, problems associated with lags of the impact of policies.
Prereq: ECON 301, 302, 321

ECON 404 3C 0.5
Advanced Monetary Theory and Policy
A discussion of topics in monetary policy. Topics may include: foundations of monetary theory; portfolio choice; term structure of interest rates; money supply and money demand; decision-making under uncertainty; capital asset pricing models; financial flow analysis; rational expectations and monetary policy.
Prereq: ECON 211, 221, 301 and 302
Recommended: Econ 402, completed or taken concurrently.

ECON 406 3S 0.5
Keynes and Post Keynesian Economics
This course draws on Keynes, Fisher, Kalecki, Weintraub, Minsky and others to explore alternatives to current macroeconomic theory and policies seeking solutions to problems of stagnation, debt crises, high interest rates and lagging growth.
Prereq: ECON 301, 302
This course is primarily for fourth-year Honours and Honours students. However, MA students and third-year students who meet the prerequisites may also be admitted.

ECON 410 F 3C 0.5
Economic Thought
A critical survey of the development of Economic Theory from Classical Political Economy to the Keynesian Revolution.
Prereq: ECON 231, 301, 302

ECON 411 F 3C 0.5
Advanced Mathematical Economics
Mathematical formulation of economic theory; introduction to dynamic optimization and optimal control theory; analysis of stability conditions; introduction to linear and nonlinear programming, game theory.
Prereq: ECON 301, 302, 311

ECON 420 F 3C 0.5
Economic Development of the United States, 1607-1975
A survey of U.S. Economic Development from the beginnings of organized settlement to the crises of the early 1970's, with special emphasis on the methods and techniques applied by the New Economic Historians since 1958.
Prereq: ECON 201, 202 and 321

ECON 421/422 F/W 3C 0.5/0.5
Econometrics 1,2
Review of linear algebra and development of basic statistical inference; formulation, identification, estimation, and tests of single equation and simultaneous equation; regression models of micro- and macro-economics; empirical models.
Prereq: ECON 201, 202, 211, 221, 321

ECON 431 W 3C 0.5
International Economic Policy
Analysis of selected policy problems of open economics from an institutional perspective. Topics include GATT and trade policy, customs union, new international economic order, multinational firms, exchange rate management and international monetary reform.
Prereq: ECON 301, 302

ECON 441 3C 0.5
Economics of the Public Sector I
An overview of fiscal functions and institutions; the theory of social goods; expenditure and revenue structures; fiscal incidence.
Prereq: ECON 231, 301, 302, 341

ECON 461A 3S 0.5
Comparative Economic Systems
This course concentrates upon the criteria which are relevant for comparing different economic systems, how well various forms of economic theory make comparisons, the development of capitalist and socialist economies, together with the analysis of alternative types of price system and planning.
Prereq: ECON 201, 202
Antireq: Students may not take both ECON 461A and ECON 461B for credit

ECON 461B 0.5
The Soviet Economy
This course considers the formation and development of the command economy in the Soviet Union, together with the current restructuring taking place.
Prereq: ECON 201, 302
Antireq: Students may not take both ECON 461A and 461B for credit

ECON 463A/B
Studies in Political Economy
Either ECON 463A or ECON 463B will be offered in the Winter term.
Check departmental listing on course offering. See course descriptions below.
Course Descriptions

Economics

Electrical and Computer Engineering

ECON 463A  F  3S  0.5
Political Economy of Capitalist Development
A study of the main tools and models of modern political economy. Micro and macro tools and concepts, based on the work of Robinson, Smith, Kiirker, and others are integrated in what can be termed the "Classical Marxian" tradition.
Prereq: Consent of instructor or Undergraduate Officer

ECON 463B  F  3C  0.5
The Political Economy of Socialism
An examination of programs for the creation of socialist economy based on the work of Horvat, Nove, Medvedev and others.
Prereq: Consent of instructor or Undergraduate Officer

ECON 471  F  3C  0.5
Computable General Equilibrium Modelling
Basic concepts and techniques of computable general equilibrium modelling, fixed-point theory and algorithms, data and calibration, system sensitivity, applications in various fields of economics, e.g., taxation, international trade, industrial organization, economic history, economic development, and fixed-price equilibria.
Prereq: ECON 211, 301, 331, or 341 are recommended

ECON 472  3S  0.5
Advanced Public Policy and Applied Economics
An advanced discussion of selected topics in macroeconomic theory, policy and empirical research. Seminar topics include the role of stabilization policy, the usefulness of incomes policy and evaluation of monetarism as practiced by the Bank of Canada.
Prereq: ECON 302, 321

ECON 481-489  3S  0.5 each
Special Studies
Research and reading courses under the direction of individual instructors. Admission by consent of instructor. See ECON Undergraduate Officer for course registration.

COURSES NOT OFFERED 1991-92
ECON 364 Contemporary Problems 2
ECON 442 Economics of the Public Sector 2
ECON 461A Comparative Economic Systems
ECON 461B The Soviet Economy

E&CE 123 W,S 3C,1T,3L  0.5
Electrical Engineering Circuits
Introduction to network variables; resistors; Kirchhoff's laws; circuit simplification techniques; circuit analysis methods; operational amplifiers and their uses; resistor-capacitor circuits; resistor-inductor circuits; sinusoids and phasors; impedance and admittance; second order circuits; resonance concepts; sinusoidal power.
Alternate weeks.

E&CE 126 W,S 3C,1T,3L  0.5
Electricity and Magnetism
Electrostatics; electric flux and potential energy, dielectrics, capacitors and capacitance; flow of electric charge and resistance; Kirchhoff's voltage and current laws; magnetism; magnetic materials and circuits; Faraday's Law and inductance.
Alternate weeks.

E&CE 201 F,W 1C  0.0
Seminar
General Seminar

E&CE 202 F,S 1G  0.0
Seminar
General Seminar

E&CE 205 F,W 3C,1T  0.5
Advanced Calculus for Electrical Engineers 1
Fourier Series; Ordinary differential equations; Laplace transform; applications to linear electrical systems.
Cross-listed as MATH 211

E&CE 206 F,S 3C,1T  0.5
Advanced Calculus for Electrical Engineers 2
Partial differentiation, relative maxima and minima, directional derivatives, divergence and curl of vector fields with applications; multiple integrals, double and triple integrals; line and surface integrals, applications of divergence and Stokes theorems. Complex analysis: limits, analytic functions, complex line integral, Cauchy's integral formula, residues. Partial differential equations.
Cross-listed as MATH 212

E&CE 208 F,W 3C,1T,3L  0.5
Electronic Circuit Analysis
Basic network concepts, including first and second order circuits in time and frequency domains, simple filters, two port parameters, operational amplifiers, diodes and applications, bipolar and field effect transistors, biasing and simple amplifiers, logic gates.
Prereq: E&CE 123 or equivalent
Alternate weeks.

E&CE 222 F,W 3C,1T,3L  0.5
Digital Computers
Prereq: GEN E 121 or equivalent
Open

E&CE 223 F,S 3C,1T,3L  0.5
Digital Circuits and Systems
Open

E&CE 231 F,S 3C,1T,3L  0.5
Electronic Devices
Review of band theory and doped semiconductors in thermal equilibrium, charge neutrality, mass action law, recombination and transport mechanisms, Boltzmann relations, derivation of p-n junction dc and ac characteristics, charge storage effects. The bipolar transistor; derivation of dc and ac terminal characteristics, equivalent circuits. The junction field effect transistor (JFET) and metal oxide semiconductor FET, derivation of dc characteristics.
Prereq: PHYS 125 or equivalent
Alternate weeks.

E&CE 251 F  3C,1T,3L  0.5
Programming Languages and Translators
Data types and representations, operations, sequence control, data control, storage management, language syntax, compilers and interpreters.
Prereq: GEN E 121
Project
E&CE 252 S 3C,1T,3L1 0.5
Data Structures
Introduction to data and data abstraction, fundamental data structures, implementing and manipulating data structures, basic file systems.
Prereq: E&CE 251
1Alternate Project

E&CE 260 S 3C,1T 0.5
Electromagnetic Devices
Introduction to electric energy generation, transmission and distribution systems. Transformers. Principles of electromechanical energy conversion. DC, three-phase and single-phase rotating machines. Specialized motors. Prereq: E&CE 126

E&CE 261 F,W 3C,1T,3L1 0.5
Energy Systems and Components 1
1Alternate weeks.

E&CE 262 F,S 3C,1T,3L1 0.5
Energy Systems and Components 2
1Alternate weeks.

E&CE 269 F,W 3C,2T,3L1 0.5
Electrical Engineering 2
1Alternate weeks.

E&CE 301 W,S 1C 0.0
Seminar
General Seminar

E&CE 302 F,W 1C 0.0
Seminar
General Seminar

E&CE 304 F,W 3C,1T 0.5
Numerical Methods
Application of computers to engineering problems. Number systems, errors and error propagation. Roots of nonlinear equations. Solution of systems of linear equations. Interpolation and numerical integration. Solution of ordinary differential equations. A non-linear algorithm (e.g. sorting). Emphasis will be placed on algorithm development and programming style. Prereq: GEN E 121 or equivalent

E&CE 316 W,S 3C,1T 0.5
Introduction to Probability Theory
Conditional probability and independence; Bayes’ Theorem; random variables; functions of random variables; distribution functions; marginal and conditional distributions; correlation; reliability; the Poisson process; applications to reliability theory, continuous-time birth and death processes, queuing theory.

E&CE 318 F,W 3C,1T,3L1 0.5
Communication Systems
Orthogonality and signal representation in continuous time. Fourier spectrum, Fourier transforms and applications to communications. Convolution. Transfer functions and filters. Power spectral density. Amplitude modulation and applications to techniques such as DSB, AM, SSB, etc. Angle modulation and the spectra of frequency modulated signals. Techniques for the generation and demodulation of FM signals. Introduction to noise and its effects in AM and FM systems.
1Alternate weeks.

E&CE 324 W 3C,1T,3L1 0.5
Microelectronic Circuits and Devices
Device theory, the pn junction diode, its characteristics. Transistor amplifiers, operational amplifiers, active filters, oscillators and logic circuits. Prereq: E&CE 208
Antireq: E&CE 332
1Alternate weeks

E&CE 326 F,S 3C,1T,3L1 0.5
Electronic Circuits
Amplifier biasing networks, single and multi-stage small-signal amplifiers, small-signal equivalent circuits; high and low frequency effects; negative feedback amplifiers; oscillators; noise in electronic circuits; introduction to large signal amplifiers. Prereq: E&CE 208, E&CE 231
Antireq: E&CE 333
1Alternate weeks

E&CE 332 S,W 3C,1T,3L1 0.5
Electronic Circuits
Amplifier biasing networks, single and multi-stage small-signal amplifiers, small-signal equivalent circuits; high and low frequency effects; negative feedback amplifiers; oscillators; noise in electronic circuits; introduction to large signal amplifiers. Prereq: E&CE 208, E&CE 231
Antireq: E&CE 333
1Alternate weeks

E&CE 335 W 3C,1T,3L1 0.5
Microelectronic Circuits and Devices
Device theory, the pn junction diode, its models and applications. Field effect and bipolar transistor models and characteristics. Transistor amplifiers, operational amplifiers, active filters, oscillators and logic circuits. Prereq: E&CE 208
Antireq: E&CE 332
1Alternate weeks

E&CE 342 W,S,3C,1T,3L1 0.5
Electrical Networks 1
Discrete and continuous signals, convolution, network equations, simulation graphs, Fourier series and transforms, frequency response of networks, Laplace transformation, z-transform

E&CE 354 W 3C,1T,3L1 0.5
Real-Time Operating Systems
Introduction, basic concepts, process management, interprocess communication and synchronization, memory management, resource management, interrupt handling, concurrent programming. Prereq: E&CE 251, E&CE 252
1Project

E&CE 371 S,W 3C,1T,3L1 0.5
Transmission Lines and Basic Field Theory
Transmission lines: transmission line equations, steady state (sinusoidal) solution, terminated lines, matching and the Smith Chart. Basic field theory: vector calculus, electrostatic and magnetostatic fields, time-varying fields and Maxwell’s equations, plane wave propagation, polarization, reflection, refraction, applied boundary value problems. Prereq: E&CE 126 or equivalent
1Alternate weeks

E&CE 380 F,W 3C,1T,3L1 0.5
Systems and Control

E&CE 401 F,S 1C 0.0
Seminar
General Seminar

E&CE 402 W 1C 0.0
Seminar
General Seminar
E&CE 403-409, 490-497  0.5
Special Topics in Electrical Engineering
Special courses on advanced topics will be offered from time to time, when resources are available. For current offerings, inquire at the Department.
Prereq: Permission of the instructor.

E&CE 408 W 3C,3L  0.5
Robot Dynamics and Control
Homogeneous transformations, kinematics and inverse kinematics, Denavit-Hartenberg convention, Jacobians and velocity transformations, Dynamics, path planning, nonlinear control, Compliance and force control.
Prereq: Permission of the instructor

E&CE 411 F,S 3C,1T  0.5
Digital Communications
Random processes: stationary processes, power spectral density, noise, low-pass and band-pass processes, Sampling and pulse transmission, Signal distortion, bandwidth for pulse transmission, pulse detection, and matched filtering, Digital multiplexing, line coding, pulse shaping, detection and error rates, ISI and equalization, Pulse-code modulation, delta modulation, quantization, and detection errors, Effects of noise in PCM systems.
Prereq: E&CE 318, E&CE 316 or by permission of instructor

E&CE 412 W 3C,1T  0.5
Data Communications
Representation of signals, gaussian processes, optimum receiver design, equivalent signal sets, non-white channel noise, maximum likelihood receiver, Performance of coherent and noncoherent communication systems, phase shift keying, frequency shift keying, Information and its measure, source encoding, error-free communication, channel capacity, Error-correcting codes: linear block codes, cyclic codes, convolutional codes.
Prereq: E&CE 411 or permission of instructor

E&CE 413 W 3C,1T  0.5
Digital Signal Processing
Review of continuous and discrete-time systems, z-transform, Frequency response, Analog filter design and transformations for digital filter design, Windowing techniques, the discrete Fourier transform, Selected applications of digital signal processing.
Project

E&CE 427 F,W 2C,1T,3L  0.5
Digital Systems Engineering
Complexity in large digital systems, Control of design, interaction complexity, control of consequences of complexity, The topics covered include control unit design, microprogram control, design for testability, fault tolerance, multiprocessor systems.
Prereq: E&CE 223
Project

E&CE 428 F,S 3C,1T  0.5
Computer Communications Networks
Use of computer networks, Network architecture, ISO reference model, Network topology, connectivity analysis, delay analysis, local access design, Physical layer, data link layer, higher layer protocols, Routing, flow control, congestion control, Local area networks.
Prereq: E&CE 222, E&CE 316, E&CE 318

E&CE 429 W 3C,1T  0.5
Computer Structures
Organization and performance of conventional unprocessors, pipelined processors, parallel processors and multiprocessors, memory and cache structures, multiprocessor algorithms and synchronization techniques, special-purpose architectures.
Prereq: One of E&CE 354, E&CE 426 or CS 354
Prereq/Coreq: E&CE 427

E&CE 435 F,S 3C,1T  0.5
Semiconductor Devices
Metal-Semiconductor junctions (Schottky barriers), heterojunctions, solar cells, light emitting diodes, photodetector diodes, JFET's, MESFET's, MUSH-ET's, VLSI bipolar and MOS devices, CCD's, power devices (SCR's, power switching transistors, PIN rectifier diode).

E&CE 436 W 2C,1T,3L  0.5
Design of Integrated Circuits and Devices
Design and process details of bipolar, JFET and MOSFET devices, Design and implementation of digital and analog integrated circuits, Process, device and circuit CAD.
Prereq: E&CE 291 or E&CE 435
Project

E&CE 437 W 2C,1T,3L  0.5
Integrated VLSI Systems
Integrated circuit design, memory cells and systems, logic arrays, VLSI design methodologies, applications in digital signal and data processing systems.
Project

E&CE 438 F,S 2C,1T,3L  0.5
Switching and Digital Circuits
Switching characteristics of transistors and diodes, non-sinusoidal wave generation and shaping, comparators, digital integrated circuits, including ECL, TL, FL, STL, MOS, CMOS.
Project

E&CE 439 W 2C,1T,3L  0.5
Analog Electronic Circuits
Analog applications of bipolar and field-effect transistors, Analysis of operational amplifiers, IC temperature compensation and biasing, Differential, low noise and power amplifiers, receiver front end design, noise analysis, Modulators, mixers, detectors, Power supplies.
Project

E&CE 444 W 2C,1T,3L  0.5
Linear Systems
Three types of linear multivariable systems are studied:
1. real time-continuous systems;
2. real time-discrete systems; and
3. modulo-two time-discrete systems.

The unifying approach of state equations is developed and the importance of linear algebra is emphasized. Topics include: time domain analysis, transform analysis (Laplace- and Z-transforms), stability considerations, system equivalence, system decompo- sition, system realization, The necessary matrix and linear-algebra theory is developed as required.
E&CE 450 F 2C,1T,3L1 0.5
Software Systems
Structured software design, software testing and maintenance. Data structures, arrays, lists, stacks, associative structures. Searching and sorting. Operating system organizations. Real-time software, principles of real-time executive (RTOS), kernel, primitives, interprocess communication and synchronization, memory management, interrupts. Block structured languages, actual and formal parameters, recursion, formal description, relationship to machine code. Compilers.
Prereq: E&CE 222 or equivalent.
1Project

E&CE 455 S 3C,1T,3L1 0.5
Software Engineering
Requirement analysis, specifications, software design, software development environments, testing, software project management, quality assurance and control.
Prereq: Computer Engineering Program or Computer Engineering Option
1Project

E&CE 456 W 3C,1T,3L1 0.5
Database Systems
Introduction, data models, file systems, database system architectures, query languages, integrity and security, database design.
Prereq: E&CE 252 or E&CE 460 or equivalent
1Project

E&CE 457 S 3C,1T,3L1 0.5
Applied Artificial Intelligence
Artificial intelligence concepts and techniques, including search, inference, knowledge representation and planning. Knowledge-based systems. Applications in electrical and computer engineering, with emphasis on design and maintenance.
1Project

E&CE 459 W 2C,1T,3L1 0.5
Sound, Noise and Electroacoustics
An interdisciplinary study of acoustical physics, human response to sound and audio engineering. Main topics include the physics of sound, acoustical measurements, human hearing, environmental noise, electroacoustical systems and transducers.
1Every third week.

E&CE 463 W 2C,1T,3L1 0.5
Power Electronics
Characteristics and ratings of power semiconductor devices with emphasis on the thyristor. General methods of achieving design objectives. Performance and analysis of power conversion circuits for both static and rotating loads.
1Open.

E&CE 464 F 3C,3L1 0.5
Insulation and High Voltage Engineering
1Alternate weeks.

E&CE 465 W 3C,1T 0.5
Power Systems
Introduction to system concepts; aspects of power system planning and operation. Energy sources, environmental and resource implications. Per-unit and co-ordinate systems. Representation of equipment such as generators, transformers and transmission lines in system analysis. Analysis of imbalanced systems and faults. Voltage and reactive power control. Load/frequency control. Power transfer and system stability. Introduction to load flow methods. High voltage dc transmission.

E&CE 467 W 2C,1T,3L1 0.5
Microwave Engineering
The theory and practice of microwave engineering, transmission line theory and scattering matrices; waveguides and cavities; microstrip lines, directional couplers and other microstrip components; computer aided design of microwave integrated circuits; Butterworth and Chebyshev filters, frequency transformations, side coupled microstrip filters and coupled waveguide cavity filters; microwave system considerations for communications.
Prereq: E&CE 371 or equivalent
1Every third week.

E&CE 474 F 2C,1T,3L1 0.5
Antenna Engineering
An introduction to the theory of radiation and of antenna and propagation engineering; linear antennas, linear arrays, aperture antennas, frequency independent antennas, measurement theory.
Prereq: E&CE 371 or equivalent
1Every third week.

E&CE 475 W 3C,1T,3L1 0.5
Guided Wave Engineering
Conducting waveguiding structures, rectangular and circular waveguides, microstrip theory and applications, numerical field analysis on microstrip lines, microstrip components. Dielectric waveguiding structures; dielectric slab waveguides, propagation theory for step-index fibres and graded-index fibres. Fibre measurements; loss measurements, time-domain and frequency-domain measurements, measurement of refractive index profiles. Fibre-optical telecommunication systems; system design considerations, fibre characteristics, source and detector characteristics.
Prereq: E&CE 371 or equivalent
1Project

E&CE 481 F,S 2C,1T,3L1 0.5
Design of Analog and Digital Control Systems
1Alternate weeks.

E&CE 482 W 2C,1T,3L1 0.5
Multivariable Control Systems
Prereq: E&CE 446, E&CE 481
1Open lab.

E&CE 485 W 2C,1T,3L1 0.5
Computer Control Applications
Prereq: E&CE 481
1Project.
Course Descriptions
Electrical and Computer Engineering
Engineering Undergraduate Office

E&CE 499 A F, S 3 L 0.5
Project
An engineering assignment requiring the student to demonstrate initiative and assume responsibility. The student will select a project at the end of the 3B term from an approved list prepared by the Department. Alternatively students can propose their own project. A faculty member will provide supervision. For a one term project, a report is required at the end of the 4A term. For a two term project, a short progress report at the end of the 4A term and a full report at the end of the 4B term are required.

E&CE 499 B W 3 L 0.5
Project
Either a continuation of E&CE 499 A or a separate one-term project.

Engineering Undergraduate Office
Undergraduate Officer
J.D. Ford, CPH 1325 F, ext. 3754

GEN E 123 W, S 3C, 1T, 3L* 0.5
Electrical Engineering
Introduction to electric and magnetic fields; basic ac circuits; amplifiers and operational amplifiers; ac circuit components; basic ac circuits; power circuits.
For Year One Chemical, Civil, Geological and Mechanical Engineering students.
*Alternate Weeks

GEN E 163 F 1C, 2T 0.25
Introduction to Methods of Mechanical Engineering
An introduction to some of the basic methods and principles used by engineers, including fundamentals of technical communication, measurements, analysis, and design. Some aspects of the engineering profession, including standards, safety, and intellectual property.

Examples drawn from Mechanical Engineering.

GEN E 165 F 1C, 2T 0.25
Introduction to Methods of Civil Engineering
An introduction to some of the basic methods and principles used by engineers, including fundamentals of technical communication, measurements, analysis, and design. Some aspects of the engineering profession, including standards, safety, and intellectual property.

Examples drawn from Civil Engineering.

GEN E 167 F 1C, 2T 0.25
Introduction to Methods of Electrical Engineering
An introduction to some of the basic methods and principles used by engineers, including fundamentals of technical communication, measurements, analysis, and design. Some aspects of the engineering profession, including standards, safety, and intellectual property.

Examples drawn from Electrical Engineering.

GEN E 170 F 1C, 3L 0.5
Engineering Graphics
An introduction to the fundamentals of orthographic, isometric oblique and perspective projection, including computer-aided projection and free-hand sketching. Basic descriptive geometry principles are introduced to solve spatial problems involving points, lines, planes, curved surfaces, intersections and developments.

GEN E 301/302 W, S, F 4 D 0.5
Special Directed Studies
This course is provided to allow enrichment for students in Engineering who have fulfilled the requirements of one or more of the courses in the 3A or 3B term by means of passing a course or courses taken during one or more work terms. The course comprises a special project pursued under the direction of a faculty member, normally in the department of the student's program.
Prereq: Permission of the Associate Chair of the Department in which the student is registered.

GEN E 303 W, S, F 3 D 0.5
International Studies in Engineering
Engineering students register for this course for credit towards the Designated Faculty Option in International Studies in Engineering, upon return from study or work terms abroad. Credit will be assessed on the basis of a written report and individual interviews. The report may include technical, nontechnical, and professional aspects of the foreign residence period. The instructor for this course is the Option Co-ordinator.
Restricted to students who are registered in the Option in International Studies in Engineering.

GEN E 315/415 W, S, F 3 D 0.5
Special Directed Non-Technical Studies
This course is provided for students who, through academic studies during international exchange programs or other university related scholarly activities, wish to request a course credit for this work. Students wishing to claim this credit must show evidence of university level academic activity not otherwise claimed for credit.
Prereq: Permission of the Associate Chair of the Department in which the student is registered.

GEN E 401/402 F, S, W 4 D 0.5
Special Directed Studies
This course is provided to allow enrichment for students in Engineering who have fulfilled the requirements of one or more of the courses in the 4A or 4B term by means of passing a course or courses taken during one or more work terms. The course comprises a special project pursued under the direction of a faculty member, normally in the department of the student's program.
Prereq: Permission of the Associate Chair of the Department in which the student is registered.
**Course Descriptions**

**Engineering Undergraduate Office**

**English**

**GEN E 411 S, F 3C 0.5**

**Engineering Law**


Restricted to fourth-year Chemical, Computer, Electrical and Systems Design Engineering Students

**GEN E 412 W 3C 0.5**

**Ethics and The Engineering Profession**

An application of philosophical analysis and theories of ethics to issues of moral conduct in the engineering profession. Discussions will include such matters as the social responsibilities of engineers, standards of product safety and liability, the assessment of acceptable risk, conflicts of interest and obligation, professional loyalty and "whistle blowing", use and enforcement of professional codes of ethics, the "democratization" of the profession, and the moral implications of technology.

Not open to First Year students.

Cross-listed as PHIL 315

**GEN E 452 W 3C 0.5**

**Technical Entrepreneurship**

Technical entrepreneurship is examined considering the role of independent business, entrepreneurial behaviour, types of business and enterprises, business structure, sources of venture concepts and capital, company operation and control, and business start-up.

Prereq: A course in Engineering Economics (or equivalent)

Restricted to fourth-year Engineering students.

**GEN E 460 F 3C, 2T 0.5**

**Orthopaedic Bioengineering**

Introduction of engineering technology to the field of orthopaedics. Specific topics deal with the repair and reconstruction of portions of the musculoskeletal system affected by trauma or pathological response. Primary study is directed toward the skeletal joints and major load carrying structure.

Prereq: Students must have background study in properties and mechanics of materials equivalent to CIV E 204 and CIV E 265. Registration in this course will be assessed on an individual basis through scheduled interviews.

Cross-listed as CIV E 460

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**English**

Undergraduate Officer

A.W. Macnaughton, HH 268, ext. 2415

**Introductory Notes**

1. Although the Department of English provides advisors to help students choose their programs, arrange their courses and conform with the University, Faculty, and Department regulations, students are urged to study the Calendar very carefully because they are themselves responsible for failure to abide by these regulations.

2. Courses normally meet three hours per week; however, each instructor determines the pattern of meetings for his or her courses.

3. In all English courses, emphasis will be placed on student essays written in connection with the reading.

4. Information on availability of courses in this section is accurate at the time of publication. Sometimes, however, course offerings must be altered because of budget restraints or availability of faculty. For precise information on course offerings, students should check with the English Department.

5. Enrolment in certain English courses which are in heavy demand and which are program requirements for English students may be subject to priority enrolment restrictions. While all English courses may be affected, those most likely to be subject to enrolment restrictions will include ENGL 200A/B, ENGL 251A/B, ENGL 343, ENGL 344, ENGL 209, ENGL 210A, ENGL 210C, ENGL 219, ENGL 306A-F, and ENGL 309A-E. Because of its place in the Applied Studies requirements, ENGL 109 may also on occasion be subject to registration restrictions.

Most courses are also taught at St. Jerome’s College.

'R' courses are administered by Renison College.

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**GROUP ONE**

Courses in this group count towards a degree as electives in any program in the University. Normally, none of them qualifies as a major credit for a General or Honours program in English. These courses are primarily designed to make students aware of the different functions of language in various contexts and to assist them to improve their writing.

ENGL 109 Introduction to Essay Writing 1
ENGL 110 Introduction to Essay Writing 2
ENGL 120R Introduction to Written English
ENGL 140R The Use of English 1
ENGL 141R The Use of English 2
ENGL 150 English as an Instrument of Thought and Communication 1
ENGL 151 English as an Instrument of Thought and Communication 2
ENGL 240R Form and Function 1
ENGL 241R Form and Function 2

Students completing any of ENGL 109, 110, 140R, 141R, 150, 151 with at least a B average may petition the English Department (through the Undergraduate Officer) to accept these courses for English major credit. This option became effective as of the Fall term 1984 and may not be applied retroactively.
Course Descriptions

English

ENGL 109 S,F,W 0.5
Introduction to Essay Writing 1
The course teaches the construction of the expository essay, with attention to the structure of good paragraphs, its techniques of putting the essay together, and to the nature of the language. Ten to 12 short writing assignments are required.

Students may receive credit for only one of ENGL 109 and ENGL 129R.
May be subject to priority enrolment

ENGL 110 W 0.5
Introduction to Essay Writing 2
The course deals with the persuasive essay. Attention will be given to the elements of logical thinking and the techniques of persuasion. The demands of the library research paper will be considered.
Prereq: ENGL 109

ENGL 129R S,F,W 1C,2L,2T 0.5
Introduction to Written English
Instruction provided in basic grammar, sentence and paragraph structure, elements of composition and essay writing including focus on theme, development of central idea, exposition and argumentation. Minimum of four hours of instruction each week with additional tutorial hours as required.
Prereq: Open only to students whose maternal language is not English and who lack language mastery sufficient for admission to other introductory English language courses
Students may receive credit for only one of ENGL 109 and ENGL 129R

ENGL 140R S,F,W 0.5
The Use of Language 1
The use and abuse of spoken and written English. The study and evaluation of language as it is used for various purposes (e.g., colloquial, scientific, legal, political, commercial, journalistic, literary) in order to increase critical awareness and to help students to write clearly and effectively.
Prereq: ENGL 140R

ENGL 141R W 0.5
The Use of English 2
A continuation of ENGL 140R. The study of factual, emotional, scientific and imaginative writing; relevance, context, meaning, tone, feeling, and intention.
Prereq: ENGL 140R

GROUP TWO
Courses in this group carry degree credit and may be counted as fulfilling the minimum requirements for a General or Honours program in English.

ENGL 102A F 0.5
The Major Forms of Literature: Short Stories and Drama
A study of short stories and drama to determine how the shape of a literary work contributes to its meaning.
Also offered at Renison College

ENGL 102B W 0.5
The Major Forms of Literature: Novels and Poetry
A study of novels and poetry to determine how the shape of a literary work contributes to its meaning.
Also offered at Renison College

ENGL 103A F 0.5
The Nature and Structure of the English Language
Introduction to the study of the English language. Topics to be discussed include the nature and origin of language, the structure of English and its development, and the relations between language and reality.

ENGL 103B W 0.5
Varieties of English
Introduction to the study of varieties of the English language - regional, social, temporal, functional, and stylistic. The relations of languages and literature and of speech and writing will be discussed.
Prereq: ENGL 103A or consent of instructor

ENGL 105A S,F,W 0.5
20th-Century Literature in English, 1900-45
A close examination of a representative selection of works by major authors writing in English such as Yeats, Woolf, Lawrence, Eliot, Hemingway, and Faulkner.

ENGL 105B W 0.5
20th-Century Literature in English, 1945-Present
A continuation of ENGL 105A. A close examination of a representative selection of works by major authors writing in English such as Thomas, Bellow, Laurence, and Atwood.
Prereq: ENGL 105A or consent of instructor

ENGL 108E F,W 0.5
Women in Literature
A study of the nature and role of women in British, Canadian, and American literature. Works by both men and women will be studied in which women are seen in such forms as mothers, saints, sex objects, and witches.

ENGL 108F F,W 0.5
The Rebel
A study of various works of literature in which the protagonist is a rebel against existing norms. The course will examine a number of rebel types and concepts, moral implications, and final outcomes either in successful realisation or in tragic defeat.

ENGL 108H S,F,W 0.5
Isolation and Alienation
The study of a variety of works centering on the theme of man in crisis, the stress being on the individual at variance with his inner self, his fellow man, or his world. The course will discuss the process in which wisdom and maturity are gained as the ultimate products of suffering.

ENGL 108M F 0.5
Youth and Adolescence
Studies the portrayal of young protagonists as they respond to the mores of adult society; their own physical, mental, and psychological development; and the expectations placed upon them by themselves and by others.

ENGL 108N F 0.5
The Wars
Studies the experience of war and attitudes toward it as revealed in literary works from different historical periods.

ENGL 190 F 0.5
Shakespeare
Designed for students in all faculties, the course examines some of Shakespeare's comedies, history plays, and tragedies. Shakespeare's variety and flexibility in developing characters and dramatic structures are stressed, as are significant themes.
No previous work in Shakespeare is required.

ENGL 200A F 0.5
Survey of British Literature 1
An historical survey of major figures, types, and trends in British literature from the Middle Ages to the late 18th century.
May be subject to priority enrolment
ENGL 200B S,W 0.5
Survey of British Literature 2
An historical survey of major figures, types, and trends in British literature from the late 18th century to the present.

May be subject to priority enrollment

ENGL 201 S,W 0.5
The Short Story
This course deals with the history and techniques of the short story, with emphasis upon works by such British, American, and Canadian writers as Henry James, James Joyce, D.H. Lawrence, Ernest Hemingway, and Alice Munro.

ENGL 205R W 0.5
The Canadian Short Story
Exploration of the Canadian short story, from its beginnings — in the bush, in the north, on the land, in the small towns — through the struggles of an urbanizing society to the present. Students will be expected to work in some depth with individual authors.

ENGL 206A S,F,W 0.5
Forms of Fantasy
This course will deal with the history and forms of fantasy written for adults. In considering the genre, related forms like the romance, the fairy tale, the fable, and the gothic horror story will be discussed. Authors such as Morris, C.S. Lewis, Tolkien, Williams, and White will be studied.

ENGL 208B F 0.5
Science Fiction
Various examples drawn, for instance, from Utopian and anti-Utopian science fiction, social science fiction, "gadget" science fiction, parapsychology, and alternate worlds and beings will be considered. Some attention will be given to the historical development of the genre.

ENGL 208C S,A,F,W 0.5
Studies in Children's Literature
This course will deal with classic works of children's literature, including fantasy written primarily for children. Selections from such authors as Kipling, Woolf, C.S. Lewis, George MacDonald, Kenneth Grahame, and Thurber will be studied.

ENGL 208E F 0.5
Women Writers of the 20th Century
A study of such major 20th-century writers as Woolf, Hellman, Murdoch, McCarthy, Lessing, Lawrence, Plath, and Atwood. Emphasis will be on the concerns of these writers with the roles of women, the writer's search for new meanings, and their innovations in literary forms.

ENGL 208H F,W 0.5
Arthurian Legend
The story of Arthur and his knights of the Round Table will be discussed as it is treated at various times in various works and genres. Such matters will be considered as the character of Arthur, the concept of Camelot, and the Fellowship of the Round Table.

ENGL 208K F 0.5
Detective Fiction
The history and characteristics of the "detective novel," the "novel of crime," and the "thriller." Attention will also be given to the novel of intrigue and espionage. Such authors as Poe, Collins, Doyle, Chesterton, Hammett, Buchan, Greene, Deighton, and I.A. Carr will be discussed. The course includes the examination of critical approaches to the form of detective fiction.

ENGL 209 F 0.5
Writing Strategies
Students practice effective writing along with the study of established models. The goal is to develop language competence to meet a variety of academic, business, and professional situations.

Prereq: ENGL 200B above
Counts as an English Major credit as of Fall 1984.

May be subject to priority enrollment

ENGL 210A F 0.5
Business and Technical Writing
A study of the principles of business and technical writing including the styles, techniques, and forms of business and technical correspondence, application letters and résumés, abstracts, outlines, and technical description, with copious writing practice. Special attention to techniques of editing and presentation. Some practice in oral presentation.

Prereq: ENGL 200B above
Counts as an English Major credit as of Fall 1984.

May be subject to priority enrollment

ENGL 210C S,F,W 0.5
Report Writing
A study in the principles and practice of good report writing including report language and styles and various forms of report organization — various kinds of short reports as well as the long formal research report.

Prereq: Second-year standing or above
Counts as an English Major credit as of Fall 1984.

May be subject to priority enrollment

ENGL 215 F 0.5
Canadian Regional Literature
This course will provide a survey of literature set in a distinctive region of Canada.

Students may receive credit for only one of ENGL 215 and ENGL 214 (offered in the years 1988-1990)

ENGL 219 S 0.5
Contemporary Usage
An in-depth, applied study of the conventions governing contemporary English grammar, punctuation, syntax, diction, spelling, and sentence structure. In addition, the course will examine variations and changes in conventions; the question of the determiners of correct usage; and the impact of dictionaries, textbooks, journals, large publishing houses, and international wire services on accepted English usage in general and on Canadian usage in particular.

Prereq: Second-year standing or above
Counts as an English Major credit as of Fall 1984.

May be subject to priority enrollment

ENGL 251A F 0.5
Literary Criticism: Practice
Close reading of poetry and narrative; acquisition of critical vocabulary and terminology. Three to five written assignments.

May be subject to priority enrollment

ENGL 251B S,W 0.5
Literary Criticism: Theory
Introduction to classical and contemporary theoretical approaches to literature; literary emphasis on drama. Three to five written assignments.

Prereq: ENGL 251A
Counts as an English Major credit as of Fall 1984.

May be subject to priority enrollment
ENGL 292 F 0.5
Contemporary Issues in Language, Writing, and Rhetoric
The course inductively defines the fields of Rhetoric and Professional Writing through an exploration of contemporary issues in language, writing, and rhetoric, as those issues are identified and dealt with, in the pertinent scholarly and professional journals, by current researchers and their work.
Prereq: Enrollment limited to RPW students.

ENGL 305A F 0.5
Old English 1
An introduction to the English language in its earliest form and to English prose in pre-Conquest England, examining Old English prose style, its principal practitioners, and their world view.

ENGL 305B W 0.5
Old English 2
An introduction to Old English poetry, noting in representative Old English poems those things about its purpose, style, and its audience which make it unique but which also provide the beginnings of the English poetic tradition.
Prereq: ENGL 305A

ENGL 306A/B/C/D/E/F
English Language and Linguistics
A study of basic linguistic principles and concepts, historical and formal.
Formerly ENGL 373 and ENGL 375

ENGL 306A F, S, W 0.5
Introduction to Linguistics
Introduction to linguistics and the principles of linguistic analysis through an examination of English phonology, forms, syntax, and discourse.?
Formerly ENGL 375A
May be subject to priority enrollment

ENGL 306B W 0.5
The History of English
Introduction to the linguistic history of English from earliest documents to the present, with some consideration of various modern dialects.
Prereq: ENGL 306A

ENGL 306F F, W 0.5
Introduction to Semiotics
A study of systems of signs, codes, and signification in language, culture, and literature.
Prereq: ENGL 306A

ENGL 307A F 0.5
Computer-Aided Learning and Literature
The principles of computer-aided learning and instruction applied to language and literary themes.
Prereq: Computer experience or permission of instructor

ENGL 309A F 0.5
Rhetoric: Principles and Practice 1
A study of various theories of rhetoric. Students are assigned several essays in order to practise and apply the principles of rhetoric to discourse.
Prereq: A 200-level writing course or consent of instructor
May be subject to priority enrollment

ENGL 309B S 0.5
Rhetoric: Principles and Practice 2
A continuation of ENGL 309A with an emphasis on the importance of style in rhetorical theory and practice.
Prereq: A 200-level writing course or consent of instructor
May be subject to priority enrollment

ENGL 309C S, F 0.5
Contemporary Rhetorical Theory
An examination of contemporary rhetorical theory and its relationships to criticism, interdisciplinary studies and computer applications.
Prereq: A 200-level writing course or consent of instructor
May be subject to priority enrollment

ENGL 309E F, W, S 0.5
Speech Writing
The analysis, writing, and performance of speeches. Analysis will focus on the theory of communication and speech models for imitation; writing, on in-class workshops; and performance, on videotaping and student evaluation of speeches.
Cross-listed as DRAMA 323
May be subject to priority enrollment

ENGL 310A F 0.5
Chaucer 1
An introduction to the poetry and the prose translations of Geoffrey Chaucer, including his dream allegories, "Trostis and Criseyde," and related compositions.
ENGL 310B W 0.5
Chaucer 2
A study of Geoffrey Chaucer's "Canterbury Tales."
<table>
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<th>Course Description</th>
<th>English</th>
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| **ENGL 335 S.F 0.5** | Creative Writing 1  
Aimed at encouraging students to develop their creative and critical potentials, the course consists of supervised practice, tutorials, and seminar discussions.  
Also offered at Renison College |
| **ENGL 336 W 0.5** | Creative Writing 2  
Designed to assist advanced creative writers to develop their skills in various genres by means of workshop processes, supervised practice, and critical discussion of one or more major projects.  
Prereq: ENGL 335 or consent of instructor |
| **ENGL 343 F 0.5** | American Literature  
The meaning of America — the myth, the dream, and the reality — as experienced through its major literary works.  
A study of works by such writers as Poe, Thoreau, Whitman, Twain, and Crane.  
May be subject to priority enrolment |
| **ENGL 344 S.W 0.5** | Modern American Literature  
Approaches to reality amid the confusion and uncertainty of 20th-century America. Emphasis on such major writers as Faulkner, Miller, and Cummings.  
May be subject to priority enrolment |
| **ENGL 345/346/347** | Studies in American Literature  
(Usually only one or two courses from this series are offered each year.) |
| **ENGL 347A F 0.5** | Contemporary American Literature  
A study of American Literature from World War 2 to the present.  
Prereq: ENGL 343 or consent of instructor |
| **ENGL 350A F 0.5** | 17th-Century Non-Dramatic Literature 1  
A study of secular and religious lyric poetry by poets such as Donne, Jonson, Herrick, Herbert, Vaughan, and Marvell. |
| **ENGL 350B W 0.5** | 17th-Century Non-Dramatic Literature 2  
A study of selected prose works of Bacon, Burton, and Browne. A more intensive study of Milton's English poetry and a selection of his prose works. |
| **ENGL 362 F 0.5** | Shakespeare 1  
A study of the plays written before 1599-1600, excluding *Julius Caesar*. |
| **ENGL 363 W 0.5** | Shakespeare 2  
A study of the plays written after 1599-1600, including *Julius Caesar*. |
| **ENGL 365/366** | Selected Studies  
Designed to provide a study in depth of problems and/or authors selected by the instructor. Students interested in initiating such courses are encouraged to do so by bringing their ideas to the attention of individual instructors.  
Prereq: Consent of instructor |
| **ENGL 409A/B W 0.5/0.5** | Writing for Special Purposes 1 and 2  
Each term will consist of three or four units on such topics as editing; magazine, newspaper, and editorial writing; advertising and public relations writing; instructional manuals; interpretation of specialized information for general audiences; writing for non-print media; ethics in writing; etc. Substantial use will be made of non-academic experts in the fields covered.  
Enrolment limited to fourth-year students in RPW program, or consent of instructor |
| **ENGL 410A F 0.5** | Satire and Sense: The Restoration and Early 18th Century  
The Restoration comedy of manners, heroic and high tragedy, poetry of the court wits and other amused commentators on society, and the major writings of Dryden, Swift, Addison, Defoe, and the early Pope. |
| **ENGL 410B W 0.5** | Sense and Sensibility: The Middle and Later 18th Century  
The probing of mores and manners by Pope and Johnson, the emergence of the novel with Fielding and Sterne, and the transformation (in "the age of sensibility") of literary attitudes and practice from classical to romanticism. |
| **ENGL 410C F 0.5** | The Romantic Movement 1  
The poetry and critical theory of Blake, Wordsworth, and Coleridge. Emphasis is primarily on poetry; selected minor writers may be considered. |
| **ENGL 430B W 0.5** | The Romantic Movement 2  
The poetry and critical theory of Byron, Shelley, and Keats. Emphasis is primarily on poetry; selected minor writers may be considered. |
| **ENGL 451A F 0.5** | Literature of the Victorian Age 1  
An historical and critical study of major poets (Browning, Tennyson, Arnold) and of the literary criticism of the period. |
| **ENGL 451B W 0.5** | Literature of the Victorian Age 2  
An historical and critical study of major novelists (Dickens, Thackeray, Eliot) and major essayists (Newman, Ruskin, Mill, Huxley). |
| **ENGL 460 A S.F 0.5** | British Literature, 1885-1918  
A study of works by such writers as Shaw, Conrad, and Yeats. |
| **ENGL 460B W 0.5** | British Literature, 1918-1945  
A study of works by such writers as James Joyce, D.H. Lawrence, and T.S. Eliot. |
| **ENGL 470A W 0.5** | Contemporary Critical Theory  
An examination of recent influential critical theories. Among the schools studied will be feminist criticism, Marxist criticism, psycholanalytic criticism and, especially, deconstruction. |
| **ENGL 470B F 0.5** | History of Literary Criticism  
An historical survey of major critical texts and movements from the Greek and Roman classics to the New Criticism of the mid-20th century, examining different critical theories and practices in a context of cultural changes. |
| **ENGL 489A F 0.5** | The Experiential Novel in 20th-century's British Literature |
| **ENGL 492A W 0.5** | Feminist Theory  
A consideration of various 20th-century feminist theoreticians. |
| **ENGL 495A/B 0.5/0.5** | Supervision of Honours Essay  
A letter grade for ENGL 495A will be submitted only after the completion of ENGL 495B. |
ENGL 481-492
Senior Seminars
From time to time, the Department may offer senior special topic seminars in the following areas. Consult with the Undergraduate Officer for details.
Courses ENGL 481 - ENGL 492 may substitute for other required Period and Genre courses.
Prereq: Four-year standing normally, and permission of the instructor

ENGL 481 (A-Z) 0.5
Special Topic Seminars in Rhetoric and Professional Writing

ENGL 482 (A-Z) 0.5
Special Topic Seminars in Linguistics and Lexicography

ENGL 483 (A-Z) 0.5
Special Topic Seminars in Old and Middle English

ENGL 484 (A-Z) 0.5
Special Topic Seminars in Elizabethan Literature

ENGL 485 (A-Z) 0.5
Special Topic Seminars in Early Seventeenth-Century Literature

ENGL 486 (A-Z) 0.5
Special Topic Seminars in Restoration and Eighteenth-Century Literature

ENGL 487 (A-Z) 0.5
Special Topic Seminars in Romantic Literature

ENGL 488 (A-Z) 0.5
Special Topic Seminars in Victorian Literature

ENGL 489 (A-Z) 0.5
Special Topic Seminars in Twentieth-Century British Literature

ENGL 490 (A-Z) 0.5
Special Topic Seminars in Canadian and Commonwealth Literature

ENGL 491 (A-Z) 0.5
Special Topic Seminars in American Literature

COURSES NOT OFFERED 1991-92
ENGL 108A The Hero
ENGL 202A/B The Bible and Literature
ENGL 203/204 Introduction to Folklore
ENGL 208D Modern Satire
ENGL 208F The Literature of Aging
ENGL 208G Ordered Chaos: The Apocalyptic Vision in Literature

ENV 214 Themes in Canadian Literature
ENGL 232 The Development of Drama to 1660
ENGL 233 Drama from 1660
ENGL 233A Drama of the Late 17th and Early 18th Centuries
ENGL 233B Drama of the Late 18th, 19th, and Early 20th Centuries
ENGL 233C Drama of the 20th Century
ENGL 233D Modern Drama
ENGL 234 Modern Drama in English from Australia, New Zealand, Africa and the West Indies
ENGL 240R Form and Function 1
ENGL 306B Modern English Grammar
ENGL 306C Historical Linguistics
ENGL 306E Linguistics and Literature
ENGL 309D Approaches to Style
ENGL 310C Non-Chaucerian Middle English Literature
ENGL 311A The Novel 1
ENGL 311B The Novel 2
ENGL 325 Reading, Leisure, and Human Development
ENGL 3458 American Fiction
ENGL 346C American Fiction
ENGL 460C British Literature 1945 to the Present

ENGL 234 Modern Drama in English from Australia, New Zealand, Africa and the West Indies

Course Descriptions
English
Environment and Resource Studies

ERS 150 F 3C 0.5
Environmental Issues: Methods and Techniques
Course will teach basic research skills to complement the problem-solving skills taught in ERS 100/101. Concentration on the "systems approach" and its use in problem solving, with attention to information gathering and organization, quantitative data analysis techniques, and presentation skills. Micro-computers will be used for report generation, information organization and basic data analysis.
Prereq: Environment and Resource Studies students only

ERS 218 F 3C 0.5
Introduction to Sustainable Environmental and Resource Systems
Examination of patterns and trends in major environmental systems and natural resource use. Analysis of these resources in the context of sustainable development. Local, regional and global systems will be examined.
Prereq: At least second-year standing

ERS 231 F 2C 0.5
Environmental Issues in a Global Perspective
This course examines the various political, economic and social factors in development and environmental concerns in various Third World countries. Special focus is on health-care systems, agricultural and forestry practices and policies, water management and resource ownership. Students are encouraged to study one country in some depth, and to submit seminars and projects.
Prereq: ENV S 195 or consent of instructor

ERS 241 W 3C 0.5
Introduction to Environmental and Social Impact Assessment
An introduction to means of assessing proposed approaches to environmentally and socially significant problems and opportunities. Special emphasis on the nature and limitations of conventional means of assessing the impacts, and overall desirability of technologies, projects, plans and policies. Close examination of case examples.
Prereq: At least second-year standing
Analysis of selected environmental field trips and discussions to chosen sites will be conducted to gather information for analysis. Key organizations/people will be involved in field trips and discussions. Field trip fee $45 per student.

ERS 280 S 1C,2flab 0.5
Applied Field Studies
Analysis of selected environmental issues or programs with particular emphasis on applied problem-solving/management perspectives. Field trips to chosen sites will be conducted to gather information for analysis. Key organizations/people will be involved in field trips and discussions.

ERS 290 F 4S/wkshp 0.5
Seminar-Workshop
Individual or small group project emphasizing multidisciplinary treatment of environmental problems. Work encouraged on situations of interest to community organizations, government agencies or other groups.

ERS 291 W,S 4S/wkshp 0.5
Seminar-Workshop
Continuation of project begun in ERS 290

ERS 295 F 2C,lS 0.5
Development of Environmental Thought 1
Examination of conflicting positions on how we do and should view the natural world and ourselves, beginning with review of the history of attitudes to the environment and our place in it. Emphasis on evolution of attitudes to human nature and the environment in industrial society, critiques of these attitudes and implications for approaches to modern environmental issues.

ERS 305 W 2C,lT 0.5
Ecosystem Perspectives and Analyze
Examination of the concept of the “ecosystem” presented in recent writings about non-equilibrium thermodynamics, ecological paradigms, conservation biology and environmental philosophy. Discussion of the theoretical and practical implications of these contrasting perspectives for issues of research/environmental management and sustainable development.

ERS 318 W 3C 0.5
Case Studies in Sustainable Environmental and Resource Systems
Detailed analysis of selected environmental systems and resource use activities. Particular attention will be given to opportunities for sustainable development and issues in implementation. Case studies will be drawn from local, regional and international experiences.

ERS 328 W 3C 0.5
Socioeconomic Impact Assessment
Introduction to the background, theory and methodology of social impact assessment (SIA). SIA as a type of social science research and as a key element in achieving more informed and responsible decision-making in society. Experience in SIA design for environmentally-relevant cases.

ERS 332 2C,1T 0.5
Current Issues in the Canadian North
Introduction to contemporary environmental, social, economic and political issues in Canada’s North, principally Yukon, Northwest Territories and Northern Quebec and Labrador. Lectures and tutorials will discuss homeland and frontier perspectives, economic development and environmental conservation, the northern economies, native land claims and political development.

ERS 352 2C,1T 0.5
International Communication System and Development
Information and ideas constitute the most basic resource of a people. This course will explore the role of various mass media, newspapers, TV, cinema, magazines, radio, travelers, in the process of development. What is the nature of mass education in a developing society? How do the media hinder or contribute to social change? These and many related questions will be explored in the context of a number of different societies.

ERS 361 W 3C 0.5
International Communication System and Development
Information and ideas constitute the most basic resource of a people. This course will explore the role of various mass media, newspapers, TV, cinema, magazines, radio, travellers, in the process of development. What is the nature of mass education in a developing society? How do the media hinder or contribute to social change? These and many related questions will be explored in the context of a number of different societies.

ERS 365 F 3C,lS 0.5
Concurrent Communication System and Development
Introduction to contemporary environmental, social, economic and political issues in Canada’s North, principally Yukon, Northwest Territories and Northern Quebec and Labrador. Lectures and tutorials will discuss homeland and frontier perspectives, economic development and environmental conservation, the northern economies, native land claims and political development.

ERS 375A/B/C F,W,S 2R 0.5
Special Readings or Seminars on Selected Topics

ERS 385 F 3C,1S 0.5
Technology/Lifestyles for a Conserver Society
What is a Conserver Society? What must we do to make our society into a Conserver Society? How do we evaluate the appropriateness of a lifestyle, or technology for a Conserver Society? Is a Conserver Society realistic? This course will explore these questions, with emphasis on student participation in discussion and in seminar presentations. Lectures will focus on the basics of various technologies and lifestyles, and on quantitative techniques for comparing these.

ERS 401 F 3C 0.5
Technology/Lifestyles for a Conserver Society
What is a Conserver Society? What must we do to make our society into a Conserver Society? How do we evaluate the appropriateness of a lifestyle, or technology for a Conserver Society? Is a Conserver Society realistic? This course will explore these questions, with emphasis on student participation in discussion and in seminar presentations. Lectures will focus on the basics of various technologies and lifestyles, and on quantitative techniques for comparing these.

ERS 405 F 3C 0.5
Technology/Lifestyles for a Conserver Society
What is a Conserver Society? What must we do to make our society into a Conserver Society? How do we evaluate the appropriateness of a lifestyle, or technology for a Conserver Society? Is a Conserver Society realistic? This course will explore these questions, with emphasis on student participation in discussion and in seminar presentations. Lectures will focus on the basics of various technologies and lifestyles, and on quantitative techniques for comparing these.
Course Descriptions
Environment and Resource Studies

ERS 390A F.W.S 4S, wkshp 0.5
Seminar-Workshop
Individual or small group project emphasizing multidisciplinary treatment of environmental problems. Work encouraged on situations of interest to community organizations, government agencies or other groups.
Prereq: Students with third-year standing in Environment and Resource Studies

ERS 390B F.W.S 4S, wkshp 0.5
Seminar-Workshop
Normally a continuation of 390A; may also be a separate project as described in 390A.
Prereq: ERS 390A

ERS 391A F.W.S 8S, wkshp 1.0
Seminar-Workshop
Same as ERS 390A but with additional intensive investigation.
Prereq: Environment and Resource Studies students only and consent of faculty

ERS 391B F.W.S 8S, wkshp 1.0
Seminar-Workshop
Normally a continuation of 391A; may also be a separate project as described in 391A.
Prereq: ERS 390B

ERS 396 W 2C, 1S 0.5
Development of Environmental Thought 2
Examination of twentieth century concerns about industrial progress and treatment of people and the environment. Focus on problems and promises of efforts to dominate nature through scientific and technological advance; alternative views on the nature of scientific knowledge and human well-being, and the rise of modern environmentalism. Assessment of alternative futures.
Prereq: ERS 295 and third-year standing or consent of instructor

ERS 400 F 3C 0.5
Senior Honours Seminar
Provides practice in applying skills that are useful to people working in different kinds of organizations. Readings, discussions and exercises emphasize problem perceptions and diagnoses, actor system analyses, and planning, management and evaluation activities as these are carried out by and within organizations. Special attention given to roles that persons having an environmental studies background may be particularly well prepared to develop and refine.
Prereq: Fourth-year Environment and Resource Studies students only or consent of instructor

ERS 418 F 3C 0.5
Seminar on Strategies for Sustainable Development
Using selected environmental systems and resource use activities the course will analyse selected policy, planning and implementation strategies for sustainable development. The analysis will include consideration of organizational and institutional arrangements. Various approaches reflecting local, regional and international experiences will be compared and contrasted.
Prereq: Fourth-year standing and ERS 318 or consent of instructor

ERS 445 W 3C 0.5
Impact Assessment and Policy Analysis: Practicum
Students will draw on knowledge and experience gained in the prerequisite theme courses to critique and/or design impact analyses of a variety of "real-world" activities, including policy initiatives, technological choices, environmentally-relevant proposals, economic strategies and others of special interest or significance.
Prereq: ERS 241, 337 and 338, or consent of instructor

ERS 476A/B/C F.W.S 2R 0.5 each
Special Readings or Seminar on Selected Topics
See course descriptions under ERS 275 and 375.
Prereq: Consent of instructor
The letter designation allows this course to be taken more than once for credit.

ERS 480 Special Topics Seminar

ERS 490A F.W.S 2C 0.5
Senior Honours Assignment
A project of sufficient scope to demonstrate mastery of problem-solving and communication skills on a selected problem or issue concerning human interrelationships with the environment. Credit weights for 490, 491 and 492 vary depending on the amount of work involved and the depth of the subject matter. Study beyond the 490 level requires faculty approval.
Prereq: Students with fourth-year standing in Environment and Resource Studies only

ERS 490B F.W.S 2C 0.5
Senior Honours Assignment
Continuation of ERS 490A
Prereq: ERS 490A

ERS 491A F.W.S 4C 1.0
Senior Honours Assignment
See description for ERS 490A.
Prereq: Students with fourth-year standing in Environment and Resource Studies only

ERS 491B F.W.S 4C 1.0
Senior Honours Assignment
Continuation of ERS 491A.
Prereq: ERS 491A

ERS 492A F.W.S 6C 1.5
Senior Honours Assignment
See description for ERS 490A.
Prereq: Students with fourth-year standing in Environment and Resource Studies only

ERS 492B F.W.S 6C 1.5
Senior Honours Assignment
Continuation of ERS 492A.
Prereq: ERS 492A

COURSES NOT OFFERED 1991-92
ERS 350 Community Action on Environmental Problems
ERS 351 Organizations and Environmental Management
ERS 360 Nature: Art, Myths and Folklore
Environmental Studies

Courses not offered in the current academic year are listed at the end of this section.

Introductory Note
There are a number of courses offered in the Faculty of Environmental Studies of an integrative nature which extend across the academic interests of the four units: School of Architecture, Department of Geography, Department of Environment and Resource Studies, and School of Urban and Regional Planning. The courses are of a general interest and are open to all students in the University. There is not an actual Department of Environmental Studies. Students interested in this area are urged to consult the course offerings of the four individual units mentioned above. These four departments/schools offer a variety of related courses allowing in-depth studies of topics covered in the Environmental Studies courses.

ENV S 178 F.W 3C,1L 0.5 Introduction to Environmental Research Methods
Introduction to methods of developing, evaluating and using evidence in Environmental Studies. Methods for summarizing and critical appreciation of data describing environmental systems. Skill development in applying statistical techniques and in using microcomputers as a research tool.

While not a prerequisite for this course, CS 100 or a high school computing course is helpful.

ENV S 195 F 2C,1S 0.5 Introduction to Environmental Studies
Provides an overview of human ecological aspects of environmental studies from an intercultural and global perspective.

ENV S 200 F.W 2C,2L 0.5
Field Ecology
Introduces the main concepts and principles of ecology; the cycling of elements; energetics and structural organization of major ecological systems; population dynamics; impact of natural resource management practices and urban and industrial development on the environment; incorporating environmental quality considerations into development activities. The laboratory sessions include field trips to study natural and disturbed ecosystems, urban and applied ecology.

Prereq: Second, third and fourth year students only
Lab fee of $5
Students may receive credit for only one of ENV S 200 and BIOL 250

ENV S 201 F 3C,1.5S 0.5 Introduction to Environmental and Planning Law
Introduction to legal concepts generally and to environmental and planning law concepts in particular. Designed both for students who do not plan to take further in depth legal courses and as a prerequisite for senior legal courses - ENV S 401 and PLAN 402. Topics to be covered include Sources of Law, Nature of Legal Remedies, Common Law, Administrative Agencies, Planning Act, Environmental Protection and Assessment Acts, and Federal Environmental Protection Act.

ENV S 220 F 2C,1T 0.5
Environmental Economics
Evaluation of various economic approaches to the environment. The links between economics, systems and the natural environment will be explored and future directions examined.

ENV S 252 F 3C 0.5
Media Tools for Environmental Studies
Instruction in basic black and white photography relating to photography's role as a media tool; basic darkroom functions, camera operation, composition, photographic theory, and photo essay production. Much of the course work and projects will be done outside the classroom in field situations of environmental concern using initiative in project development. Students are expected to supply their own cameras. A limited number of cameras will be available on a rental basis.

Prereq: Environmental Studies students; others with consent of instructor
Lab fee of $5 for use of ES Student Darkroom
Materials at student's expense

ENV S 278 F 3C,1L 0.5
Advanced Environmental Research Methods
Advanced methods for developing, evaluating and using primary and secondary data in Environmental Studies. Builds upon ENV S 178 by introducing probability and inferential statistics, statistical sampling procedures and hypothesis testing. Standard parametric and nonparametric statistical tests up to the linear regression model and extensions. Modelling of environmental phenomena in space and time using the microcomputer for data entry, storage and analysis.

Prereq: ENV S 178

ENV S 320 W 2C,1T 0.5
Environmental Economics: An Historical Perspective
An introduction to the history of economic thought as it relates to the environment. Approaches taken by economists in different eras will be assessed as to their applicability in the development of environmental policies then and now.

Prereq: ENV S 220 or consent of instructor

ENV S 334 F 3C,1L 0.5
Park Management
Basic administrative procedures in park management. Operational techniques are examined together with general policies of acquisition, operation and development.

Prereq: REC 230
Cross-listed as REC 334
Students may receive credit for only one of ENV S 334 and REC 334

ENV S 382Z F 2.5
Waterloo in Australia - RMIT
Description in Environmental Studies program section (page 10.7).

ENV S 383Z W 2.5
Waterloo in Australia - RMIT
Description in Environmental Studies program section (page 10.7)

ENV S 384Z S 2.5
Waterloo in Australia - RMIT
Description in Environmental Studies program section (page 10.7)

ENV S 392Z F 2.5
Waterloo in Australia - Victoria
Description in Environmental Studies program section (page 10.7)

ENV S 393Z W 2.5
Waterloo in Australia - Victoria
As 392Z.
Course Descriptions
Fine and Performing Arts
Fine Arts

ENVS469 F 0.5
Field Aspects of Applied Ecology
The presentation in the field of advanced techniques for collecting, evaluating and using evidence on ecological management issues. Interaction with professionals from government and private industry on ecological management issues will also be part of the course.
Prereq: One of ERS 305, GEOG/PLAN 367, or GEOG/PLAN 368
Field trip fee: $20.00

ENVS500 F 3C 0.5
Professional Development in Environmental Management
Professional practice issues, such as concepts of professionalism, ethics, the client-consultant relationship, expert testimony, interdisciplinary frameworks, private practice roles versus public or government roles, contract law, liability, communications, media and project management, will be addressed in the context of a studio project related to current environmental management issues.
Prereq: Fourth-year students or consent of instructor
Field trip fee: $15

COURSES NOT OFFERED 1991-92
ENVS 111, 202, 310, 378, 401, 411
For program information please see Chapter 8, Faculty of Applied Health Sciences, and Chapter 9, Faculty of Arts

Fine and Performing Arts
The University offers courses in:
Dance see page 16:42
Drama and Theatre Arts see page 16:44
Fine Arts see page 16:67
Music see page 16:103

For program information please see Chapter 8, Faculty of Applied Health Sciences, and Chapter 9, Faculty of Arts

Fine Arts

Undergraduate Officer
J.G. Buyers, ECH 1203, ext. 2614

Students should consult the "Fine Arts Course Offerings" lists, available from the departmental secretary, before each semester, to ensure that the courses they select are offered. Budget restrictions, enrolment and availability of faculty may cause some courses to be withdrawn.

ART HISTORY OFFERINGS

FINE 110 F 3C 0.5
Introduction to World Art 1
A comparative survey of Prehistoric and Ancient Art, and of Oriental, African, New World and Oceanian Art, emphasizing visual form as an expression of its historical and cultural context.

FINE 111 W 3C 0.5
Introduction to World Art 2
A comparative survey of Western Art from the Classical to the Modern Period, emphasizing visual form as an expression of its historical and cultural context.

FINE 210 F 3C 0.5
Modern Art 1
An examination of the history of Modern Art from the late 18th century up to the time of impressionism.
FINE 211 W 3C 0.5
**Modern Art 2**
A continuation of FINE 210, commencing with Impressionism and proceeding through the major trends of the early 20th century up to the contemporary period.

FINE 212 F 3C 0.5
**Italian and Northern Renaissance Art 1**
A survey of the innovations in European painting, sculpture, and architecture between 1260 and 1500.
Prereq: FINE 111 or consent of instructor

FINE 213 W 3C 0.5
**Italian and Northern Renaissance Art 2**
A continuation of FINE 212 starting with the masters of the High Renaissance and concluding with the art of the Mannerists.
Prereq: FINE 212 or consent of instructor

FINE 214 3C 0.5
**Medieval Art and Architecture**
A study of Early Christian Romanesque and Gothic Art.
Prereq: FINE 111 or consent of instructor

FINE 215 3C 0.5
**Baroque Art**
A study of 17th-century painting, sculpture and architecture in Italy, Spain, Flanders, France and Holland.
Prereq: FINE 111 or consent of instructor

FINE 216 3C 0.5
**Art of the 18th Century in Europe**
A study of painting, sculpture, graphic arts and architecture in 18th century Europe.

FINE 218A 3C 0.5
**The Religious Art of India**
An approach to understanding the myths, symbols and spirituality of Indian religion through a study of representative art, architecture and folk literature of Hinduism, Jainism, and Indian Buddhism.
Consult Religious Studies Cross-listed as RS 269

FINE 219 3C 0.5
**Canadian Art**
A survey that begins with the art of British and French settlers in the 17th century and concludes with developments in contemporary Canadian Art.

FINE 210 3C 0.5
**Greek Art and Architecture**
A survey of the art and architecture of the ancient Greek world from the Minoan to the Hellenistic periods.
Consult Classical Studies Cross-listed as CLAS 351

FINE 311 3C 0.5
**Roman Art and Architecture**
A survey of the art and architecture of the Roman world from Etruscan to Imperial times.
Consult Classical Studies Cross-listed as CLAS 352

FINE 313 3C 0.5
**Special Topics in 18th and 19th Century Art**
A seminar course that examines the Neoclassic and Romantic currents of art between 1750 and 1850.

FINE 316 3C 0.5
**Canadian Native Art**
An historical survey of the arts and crafts of Canadian Indian and Inuit peoples are examined with side lectures, films, and student presentations.

FINE 318 3C 0.5
**Canadian Ethnic and Traditional Arts**
An historical survey of Canadian ethnic, folk and traditional arts and crafts with particular focus on the ethnic and traditional arts of the Waterloo Region.
Admission by consent of instructor

FINE 319 3C 0.5
**Contemporary Art**
A survey of contemporary international art movements with emphasis on work since 1970. Readings in contemporary criticism and gallery visits are an integral part of the course.
Prereq: FINE 210 and 211

FINE 319A 3C 0.5
**Special Topics in 20th-Century Art: 1900-1940**
A study of the major innovations in early 20th-century painting, sculpture and architecture. Honours Art History majors interested in the modern period are encouraged to use this course as preparation for the fourth-year Honours presentation.
Prereq: FINE 211 or consent of instructor

FINE 319B 3C 0.5
**Special Topics in 20th-Century Art: 1940-1960**
A survey of the major movements during the 20 year period following the beginning of World War II, including Op Art, Action Painting, the Beat Consciousness; Happenings, Pop Art, Assemblage, Post-Painterly Abstraction and Field Painting, and Kinetic and Light Sculpture.

FINE 330 3C 0.5
**Fine Arts Exhibition Curatorship**
The development, design, documentation, security, conservation, installation, and interpretation of arts and craft exhibitions will be explored through lectures on the history, purpose and function of fine arts exhibitions; gallery visits; student projects; and the creation and presentation of an actual exhibition.

FINE 390 F 0.5
**Selected Subjects in Fine Arts**
Research and reading courses under the direction of individual instructors.
Admission by consent of instructor.

FINE 390A W 3S 0.5
**Methods in the History of Art**
For students planning a Senior Honours Presentation in Art History. Students will examine methods of formal and stylistic analysis, iconographical interpretation and the application of social and political history to the understanding of works of art. Required of all art history majors who take FINE 490/491 and 490A.
Admission by consent of instructor.

FINE 391 W 0.5
**Selected Subjects in Fine Arts**
Research and reading courses under the direction of individual instructors.
Admission by consent of instructor.

FINE 472 F 0.5
**Senior Seminar 1**
Admission by consent of instructor.

FINE 473 W 0.5
**Senior Seminar 2**
Admission by consent of instructor.

FINE 490 F S, std.R 0.5
**Senior Honours Presentation 1**
Course description on last page of Studio Offerings.
### FILM STUDIES OFFERINGS

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FINE 250</td>
<td>History of Film 1 (1895-1940)</td>
<td>History of world cinema in its silent and early sound era, covering the work of outstanding directors, national productions and movements, and their contribution to the film medium’s development into a prominent art form of the 20th century. Regular film screenings.</td>
</tr>
<tr>
<td>FINE 251</td>
<td>History of Film 2 - After 1941</td>
<td>A continuation of FINE 250. From the beginnings of the modern sound cinema (Welkos) to the contemporary period. Regular film screenings.</td>
</tr>
<tr>
<td>FINE 252</td>
<td>Film and the Quest for Meaning 1</td>
<td>An exploration of spiritual themes and issues in the cinema. An assessment of film’s special characteristics as an art form capable of addressing the human quest for a significant existence. Emphasis upon the films of Ingmar Bergman. Cross-listed as RS 266.</td>
</tr>
<tr>
<td>FINE 253</td>
<td>Film and the Quest for Meaning 2</td>
<td>A consideration of selected themes — death, evil, guilt, fate, alienation, courage, love, redemption — in the films of several of today’s leading directors. Emphasis upon a variety of directors from divergent cultural backgrounds. Cross-listed as RS 267.</td>
</tr>
<tr>
<td>FINE 255R</td>
<td>Film as Social Criticism</td>
<td>Cinema as “prophetic voice”, exploring the films of various directors as they pertain to selected themes which include technology and dehumanization, individual and collective goals, social realities and dreams, and the quest for individual and cultural identity.</td>
</tr>
<tr>
<td>FINE 258W</td>
<td>Canadian Film</td>
<td>A study of Canadian film, from 1895 to the present, based on the screening and analysis of selected films. <em>This is a WLU course for Film Studies Majors/Minors only.</em></td>
</tr>
<tr>
<td>FINE 259W</td>
<td>German Film</td>
<td>A study of major works (English subtitles) of the German cinema, beginning with the “golden age” of the 1920’s and emphasizing the New German Cinema created by directors such as Fassbinder, Wenders, Herzog, Straub, Schöndorff and others. <em>This is a WLU course for Film Studies Majors/Minors only.</em></td>
</tr>
<tr>
<td>FINE 270W</td>
<td>The Film as a Modern Medium</td>
<td>A study of the technical problems of filmmaking, leading to the writing, production and editing of a silent film. <em>This is a WLU course for Film Studies Majors/Minors only.</em></td>
</tr>
<tr>
<td>FINE 271W</td>
<td>Sound and Colour in Film</td>
<td>A study of the principles of sound recording for film and of the colour laboratory and its techniques. The students will produce a short colour/sound film. <em>Prereq: FINE 270W, any other film course or consent of instructor. This is a WLU course for Film Studies Majors/Minors only.</em></td>
</tr>
<tr>
<td>FINE 275R</td>
<td>French Film After 1945</td>
<td>A study of major achievements of the French cinema after World War II. Discussion and comparison of the two main creative impulses of the period: the <em>Academic tradition</em> of the 40’s and 50’s, and the rebellious <em>nouvelle vague</em> of the 60’s. (Bresson, Carné, Ophuls, Renoir, Chabrol, Godard, Malle, Truffaut, Resnais, and others.) Regular film screenings.</td>
</tr>
<tr>
<td>FINE 276R</td>
<td>Central and East European Film</td>
<td>Examination of the development of the motion picture art in Central and Eastern Europe after World War II. Selected work of prominent directors of Czechoslovakia, Hungary, Poland, the USSR, and Yugoslavia will be discussed (Chytilová, Forman, Jancsó, Makavejev, Tarkovsky, Wajda, and others). Regular film screenings.</td>
</tr>
<tr>
<td>FINE 279W</td>
<td>The Cinema of Science Fiction</td>
<td>A chronological survey of one of the most intriguing of film genres. Discussion of its aesthetic, philosophical and cinematic aspects. Film screenings will present major international works in this genre (Godard, Kubrick, Lang, Marker, Siegel, Tarkovsky, Truffaut and other directors). Regular film screenings.</td>
</tr>
<tr>
<td>FINE 280W</td>
<td>Contemporary Italian Film</td>
<td>A study of major achievements of the Italian cinema in its post-Neo-Realist period. Discussion of the works of major directors since the late 1950’s. Antonioni, Bertolucci, Fellini, Olmi, Taviani, Rosi, Visconti and others. Regular film screenings.</td>
</tr>
<tr>
<td>FINE 281W</td>
<td>The Cinema of Television</td>
<td>Examination of principles of the audiovisual and the main structural elements of the cinematic work. Discussion of the relationship between film, television and other arts/media. Regular film screenings.</td>
</tr>
</tbody>
</table>

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**Course Descriptions**

**Fine Arts**

**FINE 490A** F S, std, R 0.5  
*Senior General Seminar*  
As in Fine Arts 390A, each student will work under the direction of a Fine Arts faculty member on an advanced research project. Required of all fourth-year general art history majors.  
*Admission by permission only.*

**FINE 491** S, std, R W 0.5  
*Senior Honours Presentation 2*  
Course description on last page of Studio Offerings.

**FINE 491A** W 0.5  
*Senior General Seminar 2*  
A continuation of FINE 490A.
FINE 361 2L, 2D 0.5  
Film and Television 2  

FINE 380Z and 381Z  
Film Studies Seminar  
An introduction to key aspects of motion picture and TV production, film preservation and restoration with visits to studios, film archives, and museums. Screenings of selected films and discussions focussing on material unavailable in Canada. Meetings with scholars/students. (Three weeks in Paris and London.)

FINE 380 F R 0.5  
Selected Subjects in Fine Arts  
Research and reading courses under the direction of individual instructors.  
Admission by consent of instructor.

FINE 390 W H 0.5  
Selected Subjects in Fine Arts  
Research and reading courses under the direction of individual instructors.  
Admission by consent of instructor.

FINE 470 F 0.5  
Senior Seminar in Film Concepts 1  
Film screenings.  
Admission by consent of instructor.

FINE 471 W 0.5  
Senior Seminar in Film Concepts 2  
Film screenings.  
Admission by consent of instructor.

FINE 490 F S, std, R 0.5  
Senior Honours Presentation 1  
Course description on last page of Studio Offerings.

FINE 490A F S, std, R 0.5  
Senior General Seminar  
Course description in Art History offerings.

FINE 491 W S, std, R 0.5  
Senior Honours Presentation 2  
Course description on last page of Studio Offerings.

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**STUDIO OFFERINGS**

**FINE 120 F 6std 0.5**  
Fundamentals of Visual Art 1  
An introduction to the fundamental principles and concepts of visual art through a series of experimental studio problems in two and three dimensional materials and media.

**FINE 121 W 6std 0.5**  
Fundamentals of Visual Art 2  
A continuation of FINE 120 with emphasis on colour.  
Prereq: FINE 120

**FINE 220 F 6std 0.5**  
Fundamentals of Painting 1  
An exploration of the problems and possibilities of painting as a vehicle for serious creative expression. The fundamentals of composition and painting techniques will be presented through a series of studio projects.  
Prereq: FINE 120/121 or consent of instructor

**FINE 220A 6std 0.5**  
Watercolour Painting  
An exploration of the technique of watercolour painting as a means of creating both non-objective and representational forms on a two-dimensional surface.  
Prereq: FINE 120/121

**FINE 221 W 6std 0.5**  
Fundamentals of Painting 2  
A continuation of the studio projects begun in FINE 220 with a greater emphasis on the development of individual expression.  
Prereq: FINE 220 or consent of instructor

**FINE 222 F 6std 0.5**  
Fundamentals of Sculpture 1  
An introduction to sculpture. Three-dimensional form will be explored with the emphasis on the handling of clay and wood as expressive media enhanced by surface treatment.  
Prereq: FINE 120/121

**FINE 223 W 6std 0.5**  
Fundamentals of Sculpture 2  
An introduction to multi-media sculpture. Additive and subtractive use of wood, metal and plaster casting together with a mastery of three-dimensional forms in a variety of media.  
Prereq: FINE 120/121

**FINE 223A 6std 0.5**  
Clay Studies  
Using a variety of clay bodies and firing techniques, students will explore figurative and abstract sculptural concepts, to develop a working knowledge of clay as a sculptural medium.

**FINE 224 F 6std 0.5**  
Introduction to Drawing  
Students will make analytical and expressive drawings in a variety of media, in order to develop accurate observation and understanding of form.  
Prereq: FINE 120/121

**FINE 225 W 6C, std 0.5**  
Analytical Figure Drawing  
Analytical figure drawing from the model will be combined with a study of human anatomy for artists.  
Prereq: FINE 120/121

**FINE 226**  
Printmaking  
Introduction to materials and methods of printmaking. Current offerings are given below.

**FINE 226A**  
Introduction to Printmaking  
Introduction to the basic processes in relief and intaglio printmaking. Relief printmaking will include linocut, woodcut, singular and multiple colour printing. Intaglio printmaking will include etching, drypoint, and collagraph.  
Prereq: FINE 120/121

**FINE 226B**  
Printmaking (Lithography)  
An introduction to basic lithographic processes using aluminum plates, including multiple colour printing.  
Prereq: FINE 150/121

**FINE 226C 6std 0.5**  
Printmaking (Screen)  
An introduction to screen printing, with emphasis on exploration of ink properties and stencil techniques.  
Prereq: FINE 120 or consent of instructor

**FINE 227 6std 0.5**  
Objective Drawing  
Perspective Drawing, Rendering of geometric forms, and techniques of accurate drawing of biological subjects in line, value, and colour, using various drawing media.
FINE 228
Applied Arts
The history, design and practice of various applied arts will be explored in slide lectures and studio projects. Specific arts will vary from year to year; current offerings are given below.
FINE 228A 6C std 0.5
Expressive Textile Forms
The history of textile arts and problems of design for textile media will be explored combining lectures and studio projects. Traditional textile materials and methods will be applied to the creation of contemporary expressive and autonomous forms. Students will supply their own materials.

FINE 228B 6std 0.5
Images and Effigies
A study of contemporary and historical images and effigies in art, ritual, and popular culture, and a series of related studio projects and classroom presentations.

FINE 228C 3C std 0.5
A continuation of FINE 228A. A critical examination of the various aspects of assemblage, including visual poetry, processes, events, conceptualization, and structuralism.

FINE 228D 6std 0.5
Photography for Artists
Introduction to photographic techniques for use as a tool for artists. Basic techniques will be taught through a series of exercises, with emphasis on applications for creative artistic expression and documentation. Intended for Fine Arts majors. Supplies at students expense.
Prereq: FINE 120/121

FINE 228E 6std 0.5
Calligraphy
A study of the art of written forms, combining studio projects with slide lectures on the history of writing, illuminating and lettering. Students will strive for mastery in various calligraphic forms selected from among historic styles such as Roman, Uncial, Bookhand, Gothic, Italic and Fraktur.
Prereq: FINE 120 or consent of instructor

FINE 228F 6std 0.5
Electronic Imaging I
An introduction to the use of the computer for monochrome and colour two dimensional image generation and manipulation. Students will produce 35mm colour transparencies and colour photographic prints to document their work. Intended for Fine Arts majors.
Prereq: FINE 120 or consent of instructor

FINE 320 F 6std 0.5
Advanced Painting 1
Drawing upon the experience gained in FINE 220/221 this course will emphasize the student's individual development as a beginning painter, through independent problems, along with class discussions and individual critiques. 
Prereq: FINE 220/221 or consent of instructor

FINE 321 W 6std 0.5
Advanced Painting
A continuation of Fine arts 320 with a further emphasis on independent problems.
Prereq: FINE 320 or consent of instructor

FINE 322 F 6std 0.5
Advanced Sculpture 1
An exploration of sculpture problems in a variety of media as vehicles for serious creative expression.
Prereq: FINE 222/223

FINE 323 W 6std 0.5
Advanced Sculpture 2
Organization and integration of sculptural concepts in clay to develop a series of representational or abstract sculptures. Clay and glaze technology for oxidation stoneware firing will be stressed.
Prereq: FINE 322

FINE 323A 6S std 0.5
Assemblage
A two and three dimensional study of the various aspects of assemblage, including visual poetry, processes, events, conceptualization, and structuralism.

FINE 324 F 6std 0.5
Advanced Drawing
An exploration of drawing problems in a variety of media. The emphasis is on students becoming familiar with contemporary approaches to drawing and developing their own individual expression.
Prereq: FINE 224 and 225, or consent of instructor

FINE 325 W 6std 0.5
Advanced Drawing 2
Continuation of FINE 324

FINE 326A
Advanced Printmaking
Advanced processes in printmaking depending on the previous experience of students in the class. Experiments with mixed media, 3-D prints and bookworks will be included.
Prereq: FINE 226A and FINE 226B or FINE 226C

FINE 326B 6std 0.5
Advanced Calligraphy
A combination of tradition and experiment with the letter as art form. Students will work with traditional materials and explore new or unusual materials or combinations of materials. They will also be encouraged to develop their own classical or experimental projects.

FINE 326C 6std 0.5
Selected Subjects in Fine Arts
Studio and practice courses under the direction of individual instructors.
Admission by consent of instructor.

FINE 328 F 6std 0.5
Selected Subjects in Fine Arts
Studio and practice courses under the direction of individual instructors.
Admission by consent of instructor.

FINE 329 3C std 0.5
Illustration
Studio work in techniques and theory of book illustration, together with slide lectures on the history of printed forms.
Prereq: Consent of instructor

FINE 329A-D 0.5
Advanced Calligraphy
A continuation of FINE 226D, a critical exploration of commercial illustration, type and symbol of design, multi color print reproduction and various other advanced graphics techniques.
Prereq: FINE 226D

FINE 329B W 6std 0.5
Electronic Imaging II
A continuation of FINE 228H and an introduction to three dimensional image generation and manipulation. Students will produce 35mm transparencies and color photographs to document their work. Intended for Fine Arts majors. Supplies at student's expense.
Prereq: FINE 228H or consent of instructor

FINE 329C 3C std 0.5
Illustration
Studio work in techniques and theory of book illustration, together with slide lectures on the history of printed forms.
Prereq: Consent of instructor

FINE 392 F R std 0.5
Selected Subjects in Fine Arts
Studio and practice courses under the direction of individual instructors.
Admission by consent of instructor.

FINE 393 W R std 0.5
Selected Subjects in Fine Arts
Studio and practice courses under the direction of individual instructors.
Admission by consent of instructor.

FINE 394A-D 0.5
Fine Arts Abroad
Working in the field with landscape, citiescape, and monuments of art, students will employ a variety of media to develop techniques for visual reporting, documentation, note-taking, and journal-keeping. Individual aesthetic responses to a wide range of subject matter will be encouraged.

FINE 420 6std 0.5
Senior Graphics Techniques 1
Admission by consent of instructor.
FINE 472 F R,std 0.5
Senior Seminar 1
Independent study/practice course under the direction of individual instructors.
Prereq: Consent of instructor

FINE 473 W R,std 0.5
Senior Seminar 2
Independent study/practice course under the direction of individual instructors.
Prereq: Consent of instructor

FINE 474 F R,std 0.5
Senior Seminar 3
Independent study/practice course under the direction of individual instructors.
Prereq: Consent of instructor

FINE 475 W R,std 0.5
Senior Seminar 4
Independent study/practice course under the direction of individual instructors.
Prereq: Consent of instructor

FINE 480 F 3C 0.5
Fine Arts Praxis
A seminar for students in their final year of Fine Arts study, in which studio exercises will be combined with research into current issues in Canadian and International art.
Prereq: Consent of instructor

FINE 490 F 6std 0.5
Senior Honours Presentation 1
Each student will work under the direction of a Fine Arts faculty member on an advanced creative or research project. The result of this endeavor will be presented in the form of an exhibition or its equivalent (i.e., film, illustrated book, portfolio, or essay), which will be examined by faculty members of Fine Arts and also, where pertinent, by members of other departments.
Prereq: Consent of all students in Honours Fine Arts.
Admission by permission only.

FINE 491 W 6std 0.5
Senior Honours Presentation 2
A continuation of FINE 490.
Admission by permission only.

Course Descriptions
Fine Arts
French

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French

Undergraduate Officer
R.J. Fournier, ML 335, ext. 2181

Students should consult the Department of French undergraduate brochure, available from the departmental secretary, before each trimester, to ensure that the courses they want are offered. Budget restrictions, enrolment and availability of faculty may cause some courses to be withdrawn.

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LANGUAGE COURSES

1. The Department reserves the right to refuse admission to, and/or credit for, any of its language courses to a student who has, in the view of the Department, a level of competence unsuited to that course.

2. Students with some elementary or secondary school French not exceeding Ontario Grade 10 French or equivalent should enrol in French 151. Those with Ontario Grade 11 French or equivalent should enrol in French 152.

3. Students with Ontario Grade 12 French or equivalent should enrol in French 155.

4. Students with Ontario Grade 13 or Ontario Academic Course French should enrol in French 192A/B and/or French 195A/196.

5. Students may enrol in courses for which they have secondary school antirequisites only with the written permission of the Department of French.

6. All students who have Ontario Grade 13 or Ontario Academic Course French or equivalent and intend to register in any University of Waterloo French language course at the 100 level (FR 151, 152, 155, 156, 192A, 192B, 195A, 196) must take the French Language Placement Test to be held on Thursday, September 5, 1991, 11:30 a.m. to 1:30 p.m. in Arts Lecture Hall 116.

7. Linguistics, Language, Civilization, and Literature courses are listed separately below.

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FR 151 F,W,S 3C,1L 0.5
Basic French I
For students with some elementary or secondary school French not exceeding Year Two (Grade Ten in Ontario) or equivalent. Emphasizes comprehension, grammar and basic speaking skills.
Antireq: Ontario Grade 11 French or equivalent. See above, notes 1-6

FR 152 F,W,S, 3C,1L 0.5
Basic French II
A continuation of the work done in FR 151.
Prereq: FR 151 or equivalent
Antireq: Ontario Grade 12 French or equivalent

FR 155 F,W,S 4C,1L 0.5
Intermediate French Language I
A comprehensive study of French grammar and vocabulary, involves reading, writing and speaking French.
Prereq: FR 152 or Ontario Grade 12 French or equivalent
Antireq: Ontario Grade 13 or Ontario Academic Course French or equivalent.
See above, notes 1-6

FR 156 F,W,S 4C,1L 0.5
Intermediate French Language II
A continuation of the work done in FR 155.
Prereq: FR 155

FR 192A F,W 4C,1L 0.5
Advanced French Language 1A
An intensive French Language course. Emphasis will be placed on strengthening oral expression, comprehension of spoken French, reading and writing skills.
Prereq: Ontario Grade 13 or Ontario Academic Course French or equivalent.
See above, notes 1-6
Also offered at St. Jerome's College.

FR 192B F,W,S 4C,1L 0.5
Advanced French Language 1B
Continuation of FR 192A.
Prereq: FR 192A
Also offered at St. Jerome's College.

FR 193 3C 0.5
French for Francophone Students
A first level course for francophones and near-fluent speakers of French. Emphasis will be on grammatical accuracy.
Prereq: Consent of the Department
FR 201 F.W.S 4C,1L 0.5
Advanced French Language 1C
A transitional course, enabling students at the Intermediate level in Year 1 to join the Advanced stream of language courses. Students who successfully complete this course may continue to FR 250.
Prereq: FR 156 or consent of the Department

FR 208D 3C 0.5
Spoken French Through Drama
A course which will use the rehearsal and performance of a play in French as a basis for intensive oral training. Students will participate in the preparation of the play, and also do a project related to the play.
Prereq: FR 250, FR 250A or consent of the Department

FR 250 5C 1.0
Advanced French Language 2
Continued intensive study of spoken and written French, with emphasis on more difficult problems of the language. Taught in French.
Prereq: FR 192A and FR 192B or FR 195 and FR 196 or FR 201 or consent of the Department.

FR 250A 3C 0.5
Advanced Spoken French 2
A course intended to develop the oral and aural skills learned in FR 250.
Small group work.
Prereq: FR 250

FR 255 3C,1L 0.5
Business French
A French language course designed to enable the student to carry on standard business practices in spoken and written French.
Prereq: FR 192A/B, 195/196, 201 or consent of the Department

FR 293 3C 0.5
French for Francophone Students 2
A second level course for francophones and near-fluent speakers of French. In addition to continued emphasis on correct usage, attention will be paid to stylistic improvement.
Prereq: FR 193 or consent of the Department

FR 300 F.W 5C 1.0
Advanced French Language 3
Intensive development of writing skills through a study of stylistics and translation. Advanced oral composition will also be emphasized. Taught in French.
Prereq: FR 250 or FR 251 and FR 252 or FR 293 or consent of the Department

FR 300A F.W 3C 0.5
Advanced Spoken French 3
An advanced level course intended to continue intensive oral and aural skill development. Taught in French.

FR 400 F.W 4C 0.5
Advanced French Language 4
Intensive development of advanced comparative stylistics, translation and composition skills. Taught in French.
Prereq: FR 300 or FR 301 and 302 or consent of the Department

FR 400A F.W 3C 0.5
Advanced Spoken French 4
Further advanced level work to continue intensive oral and aural skill development. Taught in French.
Prereq: FR 300A or FR 400 or consent of the Department

LINGUISTICS COURSES

Language of Instruction: Courses are normally taught in French. However, in the case of students not enrolled in a French Major or Honours Program, permission may be given for written assignments and examinations to be done in English.

FR 409 3C 0.5
Medieval French Language
Introduction to the early development of French.

CIVILIZATION COURSES

Language of Instruction: Courses are normally taught in French. However, in the case of students not enrolled in a French Major or Honours Program, permission may be given for written assignments and examinations to be done in English.

FR 263 3C 0.5
Aspects of France
An examination of contemporary French society through documents taken from different media.
Prereq: FR 192 or consent of the Department
Also offered at St. Jerome's College.

FR 291 3C 0.5
French Civilization 1
This course traces the cultural development of France from its origin to the French Revolution. Emphasis is given to the study of music, art, architecture, literature, ideas and “daily life” in their historical context.
See Note under FR 292.

FR 292 3C 0.5
French Civilization 2
This course completes the study of the cultural development of France to 1900. After that, the course emphasizes a study of life in these two areas today. Considerable attention will be paid to art, politics, industry, etc.
Prereq: FR 291 is recommended. FR 291 and 292 are taught in English. Open to Arts students in second year and higher, and to others in any year. Students in a French Major, Honours, or Minor Program are encouraged to take this course as an elective.

FR 393/A 0.5/0.5
French Civilization, 1884-1914
Offered in the Nantes Program.
LITERATURE COURSES

Language of instruction:
Courses are normally taught in French. However, in the case of students not enrolled in a French Major or Honours Program, permission may be given for written assignments and examinations to be done in English.

FR 195A/B 0.5/0.5
French Thought
A survey of the principal thinkers and currents of ideas in France from the Renaissance to the Present. Offered in the Nantes Program.

FR 196 3C 0.5
French Studies 1
A survey of French civilization and literature prior to the 18th century and an introduction to the discipline. Language skills will be developed through dictées, composition and written assignments. Taught in French.
Prereq: OAC or Grade 13 French or equivalent
Also offered at St. Jerome's College.

FR 231 3C 0.5
Survey of 17th-Century French Literature
This course will trace the development of French literature from 1600-1700. Taught in French.
Prereq: FR 195 and FR 196 or consent of the Department
Also offered at St. Jerome's College.

FR 232 3C 0.5
Topics and Problems in 17th-Century French Literature
A more detailed study of writers/works of the classical period. Taught in French.
Prereq: FR 195 and FR 196 or consent of the Department

FR 253 3C 0.5
Romanticism
This course will deal with French literature between 1789 and 1848. This course will explore the principal literary movement of this period. Romanticism. Taught in French.
Prereq: FR 195 and FR 196 or consent of the Department

FR 264 3C 0.5
20th-Century French Theatre
The study of a representative number of authors and texts from Claudel to Ionesco. Taught in French.
Prereq: FR 195 and FR 196 or consent of the Department

FR 275 3C 0.5
Contemporary French-Canadian Novel
A study of a limited number of texts by authors such as Gabrielle Roy, André Langevin, Hubert Aquin, Gérard Bessette. Taught in French.
Prereq: FR 195 and FR 196 or consent of the Department

FR 342 3C 0.5
18th-Century French Literature
This course will trace the development of French literature from 1700-1800. Taught in French.
Prereq: FR 195 and FR 196 or consent of the Department
Also offered at St. Jerome's College.

FR 343 3C 0.5
Topics and Problems in 18th-Century French Literature
A more detailed study of one or more aspects of the Enlightenment. Taught in French.
Prereq: FR 195 and FR 196 or consent of the Department

FR 354 3C 0.5
Realism and Naturalism
This course will study the literature from 1848 to 1900. It will cover not only the major writers but also the theories behind the social, artistic and intellectual trends in this part of the century.
Prereq: FR 195 and FR 196 or consent of the Department

FR 363 3C 0.5
20th-Century French Novel
A survey of the Novel from Proust to the present day through the study of a selection of key texts. Taught in French.
Prereq: FR 195 and FR 196 or consent of the Department

FR 371 3C 0.5
French-Canadian Poetry
A study of its evolution from Octave Crémazie to Anne Hébert and the present. Taught in French.
Prereq: FR 195 and FR 196 or consent of the Department

FR 372 3C 0.5
Contemporary Quebec Theatre
A study of contemporary Quebec theatre, from Gagnon and Gélinas to the present. Taught in French.
Prereq: FR 195 and FR 196 or consent of the Department

FR 391 3C 0.5
French Women Writers
A study of selected works by women writers in France from the Middle Ages to the twentieth century. The course will focus on the literary features of these works and on their value as reflections of the position of women in French society throughout the period. Taught in French.
Prereq: FR 195 and FR 196 or consent of the Department

FR 410 3C 0.5
Medieval French Literature
An introduction to French literature of the Middle Ages through the study of representative texts, including excerpts from the epic, courtly and satirical works. Taught in French.
Prereq: FR 195 and FR 196 or consent of the Department

FR 423 3C 0.5
Survey of 16th Century French Literature
A study of French authors of the Renaissance (1500-1600). Taught in French.
Prereq: FR 195 and FR 196 or consent of the Department

FR 424 3C 0.5
Topics and Problems in 16th Century French Literature
A focussed study of a particular theme of the Renaissance (1500-1600) writing. Taught in French.
Prereq: FR 195 or FR 196 or consent of the Department

FR 451 3C 0.5
Symbolist Poetry
The course will concentrate on the works of four poets — Baudelaire, Verlaine, Rimbaud and Mallarmé. Special emphasis will be placed on the "explication de texte" as a technique in the analysis of poetry.
Prereq: FR 195 and FR 196 or consent of the Department
Course Descriptions

French

GEOG 101 F,W 2C,2L 0.5
Introduction to Human Geography
This course focuses upon the integration of geographic elements within the world region. It will also discuss world regions, e.g., Japan, Switzerland, E. Europe, U.S.S.R., within a global context. It will also discuss world issues, including some of the following topics: the underdeveloped world, energy, the spread of arms and terrorism, environmental degradation, world trade, the flow of capital, and integrating geographical elements within the world region.

GEOG 120 F 2C,2L 0.5
The World Region
Selected areas of the world's climatic regions, emphasizing characteristic problems as well as their physical, cultural and economic interrelationships, resources use, population pressure, urban and rural land use, and human impact on the earth.

GEOG 160 W 2C,2L 0.5
Introduction to Cartography and Map Analysis
Basic concepts involved in the analysis and use of existing types of cartographic products. Background theory of the production and reproduction of topographic and thematic maps, including historical development, collection of data and symbolization.

GEOG 201 F 2C,2L 0.5
Geomorphology and Soils
The roles of geomorphological and soil forming processes in creating and modifying landscapes. The utility of geomorphological information in our everyday lives.

GEOG 202A F 3C 0.5
Location of Economic Activities
The locational structure of economic activities in the context of regional development, with the use of case studies. Basic concepts and tools are used to analyze the location structure of primary, secondary and tertiary activities.

GEOG 202B W,S 3C 0.5
The Geography of Economic Development
This course focuses upon the integrative nature of economic development through analysis of space-time relationships at different scales of geographic analysis (community, regional, national and international).

GEOG 225 F 3C 0.5
Urbanization in the Third World
An analysis of the factors behind the rapid urbanization of selected areas in Asia, Africa and Latin America, with an examination of related problems of urban planning and development control policies.

Geography

Undergraduate Officer
A. Kesik, ES1 114, ext. 3019

Courses not offered in the current academic year are listed at the end of this section.

GEOG 101 F,W 2C,2L 0.5
Introduction to Human Geography
An introduction to human geography through a survey of some of the concepts, methods, techniques and applications of geographic analysis to the human cultural environment. Directed towards people-land and location analysis themes.

GEOG 102 F,W 3C,1L 0.5
Introduction to Physical Geography
Emphasis on the natural environment as an integrated system. Selected aspects of weather—climates, water, soils, biota, landforms along with flows of energy, water and matter and their effects on the subsystems of the natural environment.

GEOG 120 F 2C,2L 0.5
The World Region
Selected areas of the world's climatic regions, emphasizing characteristic problems as well as their physical, cultural and economic interrelationships, resources use, population pressure, urban and rural land use, and human impact on the earth.

GEOG 201 F 2C,2L 0.5
Geomorphology and Soils
The roles of geomorphological and soil forming processes in creating and modifying landscapes. The utility of geomorphological information in our everyday lives.

GEOG 202A F 3C 0.5
Location of Economic Activities
The locational structure of economic activities in the context of regional development, with the use of case studies. Basic concepts and tools are used to analyze the location structure of primary, secondary and tertiary activities.

GEOG 202B W,S 3C 0.5
The Geography of Economic Development
This course focuses upon the integrative nature of economic development through analysis of space-time relationships at different scales of geographic analysis (community, regional, national and international).

GEOG 225 F 3C 0.5
Urbanization in the Third World
An analysis of the factors behind the rapid urbanization of selected areas in Asia, Africa and Latin America, with an examination of related problems of urban planning and development control policies.

Regional Problems of Europe
An introduction to the Geography of Europe which examines agricultural, industrial and urban problems. Lectures, discussions and visual presentations based on field experience of instructors.

GEOG 227 F 2C,2L 0.5
Introduction to Physical Geography
Emphasis on the natural environment as an integrated system. Selected aspects of weather—climates, water, soils, biota, landforms along with flows of energy, water and matter and their effects on the subsystems of the natural environment.

GEOG 208 F 2C,2L 0.5
Applied Climatology
World climate and weather patterns and their impact on humanity. Topics include atmospheric circulation, climate classifications, air pollution, urban climate, climate change and weather modification.

GEOG 220 W 2C,2L 0.5
The World Region and World Issues
This course will discuss specific world regions, e.g., Japan, Switzerland, E. Europe, U.S.S.R., within a global context. It will also discuss world issues, including some of the following topics: the underdeveloped world, energy, the spread of arms and terrorism, environmental degradation, world trade, the flow of capital, and integrating geographical elements within the world region.

GEOG 225 F 3C 0.5
Urbanization in the Third World
An analysis of the factors behind the rapid urbanization of selected areas in Asia, Africa and Latin America, with an examination of related problems of urban planning and development control policies.

GEOG 220 W 2C,2L 0.5
The World Region and World Issues
This course will discuss specific world regions, e.g., Japan, Switzerland, E. Europe, U.S.S.R., within a global context. It will also discuss world issues, including some of the following topics: the underdeveloped world, energy, the spread of arms and terrorism, environmental degradation, world trade, the flow of capital, and integrating geographical elements within the world region.

GEOG 225 F 3C 0.5
Urbanization in the Third World
An analysis of the factors behind the rapid urbanization of selected areas in Asia, Africa and Latin America, with an examination of related problems of urban planning and development control policies.

GEOG 227 F 2C,2L 0.5
Regional Problems of Europe
An introduction to the Geography of Europe which examines agricultural, industrial and urban problems. Lectures, discussions and visual presentations based on field experience of instructors.

GEOG 275 F 2C,2L 0.5
Introductory Air Photo Analysis and Remote Sensing
Basic characteristics of various remote sensing techniques and their application in the broad field of geographic and environmental studies. Emphasis on the analysis and interpretation of air photos in 3 dimensions. Lab fee $20.
Course Descriptions

Geography

GEOG 300 S 2C,2L 0.5
Geomorphology and the Southern Ontario Environment
Study of the origin and evolution of landforms of Southern Ontario. Analysis of contemporary geomorphic processes. Study of human impact on geomorphological landscapes. The lectures will be supplemented by field trips and field work required for term projects.
Prereq: Third and fourth year students only with GEOG 201 or consent of instructor
Lab fee $10-$15.

GEOG 302 W 2C,2L 0.5
Geomorphological Processes
The impact of processes in landform development and modification. Methodologies for measuring landform changes over different time periods and under different climatic conditions. Processes discussed in detail will include two or more of the following: Glaciation and De-glaciation, Fluvial, Aeolian, Karst, Coastal and Human Activity.
Prereq: GEOG 201 or EARTH 121/122 or consent of instructor

GEOG 303 W 2C,2L 0.5
Geographical Hydrology
Study of the land based hydrological cycle and water balance with Canadian emphasis. Focus on snowcover, glacier ice, ground ice, streams and lakes and their physical, ecological and socio-economic significance.
Prereq: GEOG 201 and one of GEOG 208 or 309

GEOG 304 F 4Fieldlab 0.5
Field and Lab Techniques in Geomorphology
An analysis of the range of techniques used by geomorphologists. This course will involve intensive field surveying, mapping and laboratory work.
Prereq: GEOG 300 or EARTH 342 or consent of instructor
Field-trip expenses: $15 per student

GEOG 307 F 2C,1D 0.5
Social Survey Techniques
Social research and the planning process, interview and self administered surveys; questionnaire design; profile data; sampling; data processing; non-survey data collection techniques; practical applications.
Prereq: Second- or third-year students with ENV S 178 or consent of instructor
Cross-listed as PLAN 307
Students may receive credit for only one of GEOG 307 and PLAN 307.
Estimated additional cost to student: $10

GEOG 311 F 3C 0.5
Regional and Local Development
Economic development at regional and local scales. Emphasis on theoretical frameworks, empirical studies and planning issues.
Prereq: GEOG 202A and GEOG 202B or consent of instructor

GEOG 318 W 1C,2L 0.5
Multivariate Statistics
The theory and application of multivariate statistics, with particular emphasis upon the use of the computer.
Prereq: ENV S 278 or consent of instructor
Cross-listed as PLAN 316
Students may receive credit for only one of GEOG 316 and PLAN 316

GEOG 320 F 2C,2L 0.5
Regional Geography
The approach of the regional geographer is illustrated using one or more specific regions. Political, social and historical processes are studied as they affect perception of the regional environment. Example regions used are Austria, Alps and Mediterranean World, Greece, Hungary, Switzerland.
Prereq: A first-year human geography course

GEOG 322 F 2C 0.5
Geographical Study of Canada
Geographical basis of Canada and Canadian issues. Selected problems relating to nationalism, regionalism, environmental quality, urbanization, regional disparities and resource development.

GEOG 323 F 3C 0.5
Perspective on International Tourism
The character, problems of, and prospects for tourism are examined through consideration of tourism in a variety of countries and regions, both developed and developing. Topics include the nature and significance of tourism; economic, environmental and social impacts of tourism; and costs and benefits of tourism to destination area.
Prereq: GEOG 202A, REC 230 or consent of instructor

GEOG 326 W 3C 0.5
Gender Roles and Development Alternatives In the Third World
The course examines several conceptual research methods and action approaches, ranging from conventional development theories to feminist perspectives; from planning (macro and micro level) and program developments for women to popular, grass-roots community movements in the development processes at work.
Prereq: First- or Second-year Third World Development courses

GEOG 332 F 3C 0.5
Health and Disease in the Third World
Geographic concepts and issues in studying health related problems. Topics include: morbidity and mortality patterns, "population at risk", malnutrition, poverty, access to modern health care, and alternative health care systems. Regional case studies from the developing countries (seminar method).
Prereq: Second-year Third World Development courses or consent of instructor

GEOG 349 F 3C 0.5
The City as a System
Theories, models, and research procedures in the study of urban structure. Focuses on city-wide processes, urban land use, spatial economics, interaction systems, decision-making, urban growth, and the processes of development and redevelopment.
Prereq: GEOG 202A or 251 or consent of instructor
Field trip fee $5-$10

GEOG 350 F 3C 0.5
Regional Urban Systems
Theories, models and research procedures dealing with the growth and support of urban centres and city systems and their role in regional development.
Prereq: GEOG 202A or GEOG 251 or consent of instructor

GEOG 353 W 3C 0.5
Marketing Geography
Emphasizes are consumer behaviour, firm organization and behaviour, and modelling and analysis of commercial location patterns at both inter- and intra-urban scales.
Prereq: GEOG 202A
GEOG 356 F,S 3C 0.5
Resources Management
Reviews selected theories, methods, and terminology related to economic, behavioural, institutional and decision-making aspects of resources and environmental problems.
Prereq: ENV S 178 or consent of instructor
Field Trip fee $10-$15.

GEOG 358 W 3C 0.5
Water Planning and Management: Strategies and Experiences
Benchmark theory and principles of comprehensive water planning and integrated river basin management. Selected international to local scale case studies.
Prereq: Consent of instructor
Lab fee $10-$15.

GEOG 367 W 3C 0.5
Conservation in Wildland and Resource Management
Consideration of the constraints and guidelines that an application of the principles of ecology place on the planning and management of resources within natural and agricultural ecosystems. The theory and history of this subject will be discussed together with the management of wildlife, forestry, fisheries, parks and open space, and agriculture.
Prereq: ENV S 200
Cross-listed as PLAN 367
Lab fee $10-$15.
Students may receive credit for only one of GEOG 367 and PLAN 367.

GEOG 368 F 3C 0.5
Conservation/Resource Management of the Built Environment
Consideration of the constraints and guidelines that an application of the principles of ecology place on the planning and management of resources within urban and urban shadow ecosystems. The theory and history of this subject will be discussed together with urban ecomanagement, the management of waste, urban open space and parks, rehabilitated sites, and environmentally sensitive areas.
Prereq: ENV S 200
Cross-listed as PLAN 368
Lab fee $10-$15.
Students may receive credit for only one of GEOG 368 and PLAN 368.

GEOG 375 W 2C,2L 0.5
Air Photo Interpretation
The principles of air photo interpretation utilizing specific criteria visible in the conventional air photo. Examples from local and foreign environments.
Prereq: GEOG 275 and GEOG 201
Lab fee $20.

GEOG 376 F 2C,3L 0.5
Environmental Remote Sensing
Analysis of non-photographic systems of remote sensing (e.g. radar, landsat, SPOT). Study of remote sensing methods and data processing for analysis of physical and human environments.
Prereq: GEOG 275
Lab fee $10-$15.

GEOG 381 W 3C 0.5
The Nature of Geography
The roots and evolution of geographic thought, conceptual approaches and pathways. Past traditions, current issues, and future trends. The politics and sociology of geography as an art, science, and profession.
Prereq: Third or fourth year geography students.

GEOG 390 F,W 2S 0.5
Honours Thesis Proposal
The development of a research proposal under the supervision of an appropriate faculty member. Normally taken in the third year. Students considering a topic demanding questionnaire data should take GEOG 307 in third year.
Prereq: Honours Geography students only.

GEOG 391 F,W 2S 0.5
Field Research
One week field camp in which a specific area will be analysed from a geographic point of view. Individual or group analysis of specific field problems. General students may take this course only in fourth year.
Prereq: Honours or fourth year Geography students only.
Estimated cost to student: $175.

GEOG 401 F,S 3S 0.5
Glacial Geomorphology and Some Contemporary Applications
Glacial and fluvioglacial erosion and deposition and their effects on landscapes. Focus on the environmental influences of glaciation and on practical applications of glacial geomorphologists' techniques and information.
Prereq: One of GEOG 300, EARTH 342

GEOG 403 W 3S 0.5
Computer Assisted Cartography
Examination of spatial data processing and computer mapping techniques. Emphasis on digital terrain models and thematic mapping applications.
Prereq: GEOG 169 and ENV S 278 or consent of instructor.

GEOG 409 S 2S 0.5
Energy Balance Climatology
A field and lecture course including the radiation and energy balances of various surfaces, the principles of turbulent energy exchange, and the biotic response to the energy environment. These concepts will be illustrated through the collection and examination of field data. A self-directed learning approach is emphasized in this course.
Prereq: GEOG 309.

GEOG 411 W 2S 0.5
Geography of Manufacturing Firms and Industries
A companion course to GEOG 311. Emphasis on decision-making, multinational corporations, technological change, and analysis of the locational patterns of specific industries.
Prereq: GEOG 202A and GEOG 202B or consent of instructor.

GEOG 421 A F 2S 0.5
Western Europe 1
Physical, cultural, economic and political geography of Europe north of the Alps. Topics such as the development of cities, problems of agriculture, changing industrial patterns, distribution of trade, regional disparities, environmental degradation, and planning on the city, regional and national levels, will be discussed.

GEOG 421 B W 2S 0.5
Western Europe 2
Physical, cultural, economic and political geography of Europe south of the Alps. Topics such as the development of cities, problems of agriculture, changing industrial patterns, distribution of trade, regional disparities, environmental degradation, and planning on the city, regional and national levels, will be discussed.

GEOG 422 W 2S 0.5
Canada
Seminar on geographical regional synthesis as applied to Canada. Study of regions at different scales. Issues of continuing Canadian concern. A self-directed learning approach is emphasized in this course.
Prereq: GEOG 322.
**Course Descriptions**

**Geography**

GEOG 450 W 3C 0.5
City and Regional Systems
A continuation of Geography 349 and 350 with an emphasis on student projects.
Prereqs: GEOG 350 and GEOG 349 or consent of instructor

GEOG 451 F 1C, 3L 0.5
Soils Geography
Prereq: GEOG 201

GEOG 461 F 3C 0.5
Land Dereliction and Rehabilitation
Reasons for land dereliction, its processes, and effects.
Prereq: Fourth-year Environmental Studies students or consent of instructor

GEOG 470 F 2C, 2L 0.5
Applied Air Photo Interpretation
Advanced air photo interpretation and its application in geomorphology, geography, resources inventory, engineering soils, hydrology and planning studies (terrain analysis). Projects in specific fields of interest form a significant part of the course.
Prereq: GEOG 375 and GEOG 300 or consent of instructor
Lab fee: $15-$30

GEOG 471 W 2C, 2L 0.5
Advanced Remote Sensing
Principles of earth resource analysis using remotely sensed imagery and digital data with emphasis upon satellite platform sources. The coordination of supplemental imagery and ground truth missions with satellite data in a multi-strategy perspective.
Prereq: GEOG 376
Lab fee: $10-$15.

GEOG 475A/B/C F, W, S 2S 0.5 each
Independent Study of Selected Topics
Individual study of specific topics not covered in other courses. Students must develop a brief outline to be filed with the Associate Chairman, Undergraduate Studies. A faculty member must agree to supervise the study.
Prereq: Third- or fourth-year geography students and consent of instructor
The letter designation allows this course to be taken more than once for credit

GEOG 490A F, W, S 3S 1.0
Honours Thesis Preparation
Preparatory work and first draft of the thesis.
Prereq: GEOG 390; fourth year Honours students
A letter grade for GEOG 490A will be submitted only after the completion of GEOG 490B.

GEOG 490B F, W, S 3S 1.0
Honours Thesis Completion
Completion of the thesis.
Prereq: GEOG 390 and GEOG 490A; only fourth year Honours students

GEOG 491A F, W, S 3S 0.5
Senior Research Paper Preparation
Preparatory work and first draft of senior research paper. Students will select topics from a list prepared by faculty advisors.
Prereq: GEOG 390; Fourth-year Honours students
A letter grade for GEOG 491A will be submitted only after the completion of GEOG 491B

GEOG 491B F, W, S 3S 0.5
Senior Research Paper Completion
Completion of senior research paper.
Prereq: GEOG 390 and GEOG 491A; only Fourth-year Honours students

**COURSES NOT OFFERED 1991-92**

GEOG 204 Soviet Union
GEOG 221 The United States
GEOG 226 Food, Agriculture and Integrated Rural Development in the Third World
GEOG 230 Cultural Geography
GEOG 309 Physical Climatology
GEOG 315 Agricultural Geography
GEOG 317 Nonparametric Statistics
GEOG 318 Spatial Analysis
GEOG 319 Economic and Social Techniques for Regional Planning
GEOG 331 Special Topics in Cultural Geography
GEOG 333 Recreation Geography
GEOG 341 Historical Geography of Canada 1
GEOG 342 Historical Geography of Canada 2
GEOG 345 Political Geography
GEOG 351 Geography of Transportation
GEOG 352 The Rural Urban Fringe
GEOG 359 Geography of Energy
GEOG 360 Preparation of Maps and Illustrations
GEOG 400 Climatic and Periglacial Morphology
GEOG 404 Cartographic Production and Design

GEOG 423 Central and Eastern Europe
GEOG 424 Soviet Union
GEOG 425 Africa
GEOG 430 Field Research in Regional Geography
GEOG 448 Urban Historical Geography
GEOG 452 Problems of Rural Land Use
GEOG 462 Land Dereliction and Rehabilitation
GEOG 481 Frontiers in Geography
GEOG 482 Geography and Education

**Geological Engineering**

Undergraduate Officer
E.L. Matyas, E2-2307, ext. 3984

GEO E 126 W 2C, 3L 0.5
Geological Engineering Concepts
An introduction to physical geology and earth processes. Geological time, introduction to earth, air and water processes including vulcanism, sedimentation, weathering, lithification, continental drift, radioactive dating, hydrogeology, pedology, resources, mass wasting, erosion.

GEO E 400 F 1C, 4T 0.5
Geological Engineering Thesis 1

GEO E 401 W 1C, 4T 0.5
Geological Engineering Thesis 2

GEO E 400 and GEO E 401 serve the role of an undergraduate thesis. Specifically, the student is expected to work with a staff member in Civil Engineering, Earth Sciences, or other appropriate department in identifying and carrying out a suitable short design or research project. The final product will be presented in thesis form and carefully scrutinized by two independent referees chosen for their familiarity with the topic. The subject may be laboratory based, analytic, numerical, or field oriented. The thesis format must follow accepted engineering practice and be of professional quality.

All other courses in the Geological Engineering program are listed under the course descriptions in Earth Sciences or Civil Engineering.
Course Descriptions
Geological Engineering
Germanic and Slavic

GER 111 F,W,S 3C 0.5
First Year Scientific German
For students with little or no knowledge of German. The basic elements of German grammar and pronunciation with an emphasis on reading and translation of elementary scientific literature from various fields.

GER 112 F,W,S 3C 0.5
First Year Scientific German
As GER 111
Prereq: GER 111

GER 121 F 3C 0.5
Studies in German Literature with Language Practice
An introduction to German literature designed to accomplish the transition from language studies to reading and discussing literary texts. Grammar review, conversation practice, and the reading of selected works.
Prereq: Grade 12 High School German, or equivalent
GER 121/122 are first year courses for students who have completed Grade 12 High School German or have an equivalent background in the language. If in doubt, consult the Department.

GER 122 W 3C 0.5
Studies in German Literature with Language Practice
As GER 121
Prereq: GER 121, or permission of the instructor

GER 201 F,W 3C 0.5
Second Year German
This course is a continuation of first year GER 101/102. It offers extensive practice in both the spoken and written language. It provides vocabulary building, grammar review, and exercises in pronunciation and comprehension. Language lab.
Prereq: GER 102 or equivalent

GER 202 W 3C 0.5
Second year German
As GER 201
Prereq: GER 201, or permission of the instructor

GER 251 F 3C 0.5
German Conversation and Grammar Review
Conversation on topics of everyday life as well as on political, social, and cultural aspects of the German-speaking countries. Comprehensive grammar review, vocabulary building, pronunciation, and written practice.
Prereq: At least two years of high school German or equivalent

GER 252 W 3C 0.5
German Conversation and Composition
As GER 251
Prereq: GER 251, or equivalent

GER 261 F 3C 0.5
The Age of Goethe (Classicism)
Reading, interpretation, and critical analysis of representative works (Goethe, Schiller, Hölderlin, etc.).
Prereq: GER 122, 252 or equivalent

GER 262 W 3C 0.5
The Age of Goethe (Romanticism)
Reading, interpretation, and critical analysis of representative works (Novalis, Tieck, Brentano, etc).
Prereq: GER 122, 252 or equivalent

GER 271 F 3C 0.5
German Thought and Culture
A survey of cultural currents to the 18th century. Lectures will focus on major developments in literature, philosophy, religion, art, architecture, and music as seen against the historical background of the German speaking peoples.
Taught in English
Open to all students above first year

GER 272 W 3C 0.5
German Thought and Culture
A survey of cultural events from the 18th century to the present. Lectures will focus on major developments in literature, philosophy, religion, art, architecture, and music as seen against the historical background of the German speaking peoples.
Taught in English.
Open to all students above first year

GER 281 F 3C 0.5
Post-War Literature
Reading and interpretation of major works since 1945 in prose, drama and poetry, Main authors: Borchert, Böll, Frisch, Dürenmatt, Grass, Eich, etc.
Prereq: GER 122, 252 or equivalent

GER 282 W 3C 0.5
Post-War Literature
As GER 281
Prereq: GER 122, 252 or equivalent

GER 291 F 3C 0.5
Survey of German Literature
Introduction to the major periods of German literature. Reading and interpretation of representative texts.
Prereq: GER 122, 252, 202 or equivalent
Course Descriptions

Germanic and Slavic

GER 292 W 3C 0.5
Survey of German Literature
As GER 291
Prereq: GER 122, 252, 282 or equivalent

GER 300A-Z F,W 3C 0.5
Film and Literature in Germany
This course introduces students to significant aspects of modern German culture through film, and links this study with that of literature. It involves viewing and analyzing films and establishing a connection to related literary and cultural traditions.
Taught in English
Prereq: Open to all students above first year
Cross-listed as FINE 359

GER 311 F 3C 0.5
Theory of Translation
Theory, methodology, and techniques of translation. Patterns and problems in the translation of scholarly texts from the arts and sciences, with special emphasis on idiom and structure as compared with the target language.
Prereq: Second-year standing in German

GER 312 W 3C 0.5
Theory of Translation
As GER 311
Prereq: GER 311

GER 351 F 3C 0.5
Intermediate Conversation and Composition
Conversation on modern topics. Exercises in advanced grammar, stylistics, and composition.
Prereq: GER 252 or equivalent

GER 352 W 3C 0.5
Intermediate Conversation and Composition
As GER 351
Prereq: GER 351 or equivalent

GER 355 F 3C 0.5
The Stage As Forum: German Drama in Translation
Major German dramas will be studied from various points of view, including historical importance, themes, and technique. The course includes theory and selected dramas of such playwrights as Lessing, Goethe, Schiller, Büchner, Brecht and Dürenmatt.
Taught in English.
Prereq: Open to students from all departments; not normally to first-year students.
This course is complemented in the Winter term by RUSS 356.
Cross-listed as DRAMA 355

GER 361 F 3C 0.5
Young Germany and Biedermeier
Reading, interpretation and critical analysis of prescribed prose, drama and poetry, (Grillparzer, Mörike, Sütter, Gotthiel, etc.).
Prereq: GER 122, 252 or equivalent

GER 362 W 3C 0.5
Poetic Realism
Reading, interpretation and critical analysis of prescribed prose, drama and poetry (Storm, Keller, Ludwig, Hebbel, Raabe, Fontane, etc.).
Prereq: GER 122, 252 or equivalent

GER 371 F 3C 0.5
Modern German Literature
Reading, interpretation and critical analysis of prescribed texts relating to the “Moderne” and various literary movements around the turn of the century.
Prereq: GER 122, 252 or equivalent

GER 372 W 3C 0.5
Modern German Literature
Reading, interpretation and critical analysis of prescribed texts from the early 20th century to the end of World War II (Kafka, Brecht, etc.).
Prereq: GER 122, 252 or equivalent

GER 391 F 3C 0.5
Masterpieces of German Literature in Translation
A study of significant prose and drama from 1770 to the present representing themes such as Man and Revolution, Duty vs. Inclination, Flesh vs. Spirit, Modern Germany East and West. Works studied include Dante’s Death (Büchner), Maria Stuart (Schorlemmer), Demian (Hesse), Galileo (Brecht), and Cat and Mouse (Grass).

GER 392 W 3C 0.5
Masterpieces of German Literature in Translation
As GER 391

GER 395Z F 2.5
Waterloo in Germany Program
Description in Arts program section.

GER 3962 F 3C 0.5
Waterloo in Germany Program
Taught in English.
Prereq: GER 3962

GER 397 W 3C 0.5
Introduction to German Linguistics
Study of the major linguistic structures of German, especially in contrast to the structures of English. Coverage of phonetics and phonology, morphology and lexicology, syntax and semantics, and differences between spoken and written German.
Prereq: GER 352 or equivalent

GER 398 W 3C 0.5
Humanism, Reformation and Baroque
Reading, interpretation and critical analysis of prescribed texts (Erasmus, Luther, Sachs, Opitz, Grynhus, Grimm, Klinger, etc.).
Prereq: Second-year standing in German

GER 422 W 3C 0.5
Introduction to German Linguistics
As GER 398
Prereq: GER 398

GER 441 F 3C 0.5
Humanism, Reformation and Baroque
Reading, interpretation and critical analysis of prescribed texts (Erasmus, Luther, Sachs, Opitz, Grynhus, Grimm, Klinger, etc.).
Prereq: Second-year standing in German

GER 442 W 3C 0.5
Enlightenment and Storm and Stress
Reading, interpretation, and critical analysis of prescribed texts (Lessing, Wieland, Klopstock, Lenz, Klinger, etc.).
Prereq: Second-year standing in German

GER 451 F 3C 0.5
Advanced Conversation, Composition and Styllistics
This course provides intensive practice in spoken and written German on the advanced level.
Prereq: GER 352 or equivalent

GER 452 W 3C 0.5
Advanced Conversation, Composition and Styllistics
As GER 451
Prereq: GER 451 or equivalent

GER 461 F 3C 0.5
Introduction to the History of the German Language with Readings in Middle High German
Prereq: GER 122, 252 or equivalent
Offered in alternate years

GER 462 W 3C 0.5
Middle High German Literature
Reading and interpretation of samples from the major works of the MHG period, with emphasis on writers of the first “Blütezeit” in German literature (1170 to 1250); Early Minnesang, Walthier von der Vogelweide, Nibelungenlied, Hartmann von Aue, Wolfram von Eschenbach, etc.

GER 471 F 3C 0.5
German Poetry
A study of the major thoughts, themes, forms and schools in German poetry from the beginning to Goethe.
Prereq: GER 122, 252 or equivalent

GER 472 W 3C 0.5
German Poetry
A study of the major thoughts, themes, forms and schools in German poetry from German Romanticism to the present.
Course Descriptions
Germanic and Slavic

DUTCH

DUTCH 101 F 3C 0.5
First Year Dutch
The basic elements of Dutch grammar with emphasis on oral practice and pronunciation, along with appropriate texts from Dutch literature. Introduction to aspects of Dutch culture.
Open to all students with little or no knowledge of Dutch.
Prereq: Approval of the Department

DUTCH 201 F 3C 0.5
Intermediate Dutch
This course will be conducted partly in Dutch and offers advanced study in grammar, composition, and conversation. Special emphasis will be given to comprehension and practice in the spoken language.
Prereq: DUTCH 102 or equivalent

DUTCH 202 W 3C 0.5
Intermediate Dutch
As DUTCH 201
Prereq: DUTCH 201 or equivalent

RUSSIAN

Introductory Note
Not all courses listed in this section are available. Please consult the 1991-92 Course Offerings List or the Department for current course information.

Russian Workshop in the USSR
A "Total Immersion" Russian language workshop for a full month at the Russian Language Seminar in Leningrad. Daily instruction by Russian faculty at the elementary, intermediate, and advanced levels, according to the proficiency of the students.
Prereq: At least one year of Russian language at the University level or equivalent
Credits: 1.5 for completion of
1. first-year Russian: 193, 194, 195 or
2. second-year Russian: 293, 294, 295 or
3. third-year Russian: 393, 394, 395 or
4. fourth-year Russian: 493, 494, 495.

The Workshop may be attended more than once. However, a maximum of 1.5 credits will normally be granted towards a degree.

RUSS 101 F 3C,1L 0.5
First Year Russian
A study of Russian grammar and composition with emphasis on oral practice and pronunciation.
Language lab
Open to all university students with little or no knowledge of Russian, except those who have credit for RUSS 111 or 112
Prereq: Approval of the Department

RUSS 102 W 3C,1L 0.5
First Year Russian
As RUSS 101
Prereq: RUSS 101 or equivalent

RUSS 111 F,S 3C 0.5
First Year Scientific Russian 1
A rapid, intensive course, designed to enable the students to master reading and translating Russian. Special emphasis on international and scientific terminology, ranging over many of the main branches of science. Notwithstanding its simplified approach, the main features of Russian grammar are treated in full.
Taught in English
Open to all students with little or no knowledge of Russian, except those who have credit for RUSS 101 or 102
Prereq: RUSS 101 or equivalent

RUSS 112 W 3C 0.5
First Year Scientific Russian 2
As RUSS 111
Prereq: RUSS 111 or equivalent
Taught in English

RUSS 201 F 3C 0.5
Intermediate Scientific Russian
A review of the fundamentals of grammar is followed by a more advanced study of the language structure and idiom. Readings and translation from contemporary scientific writing with the aim of helping the student to acquire a greater vocabulary and to master the stylistic difficulties peculiar to technical writing.
Prereq: RUSS 102, 112 or equivalent

RUSS 202 W 3C 0.5
Intermediate Scientific Russian
As RUSS 201
Prereq: RUSS 201 or equivalent

RUSS 251 F 3C 0.5
Conversation, Composition, Grammar and Phonetics
This course is basically a continuation of First-Year Russian. It provides intensive practice in spoken and written Russian. Vocabulary building, comprehension, pronunciation and intonation are stressed.
Prereq: RUSS 102, 112 or equivalent

RUSS 261 F 3C 0.5
Introduction to Russian Literary Movements
Reading of representative works from Russian Classicism, Romanticism, 19th Century Realism, and various periods of 20th century Russian literature.
Prereq: RUSS 102 or equivalent

RUSS 262 W 3C 0.5
Introduction to Russian Literary Movements
As RUSS 261
Prereq: RUSS 102 or equivalent

RUSS 271 F 3C 0.5
Russian Thought and Culture
A survey of cultural history from the beginnings to 1905. Lectures will focus on major developments in literature, philosophy, art, architecture, and music as seen against the background of Russia's historical past. Discussion will be devoted primarily to works of Russian literature.
Taught in English.
Open to all students.

RUSS 272 W 3C 0.5
Russian Thought and Culture
A survey of cultural history from 1905 to the present. Lectures will focus on major developments in literature, philosophy, art, and music as seen against the background of Russia's historical past. Discussion will be devoted primarily to works of Russian literature.
Taught in English.
Open to all students.

RUSS 311 F 3C 0.6
Theory of Translation
Theory, methodology, and techniques of translation. Patterns and problems in the translation of scholarly texts from the arts and sciences, with special emphasis on idiom and structure as compared with the target language.
Prereq: RUSS 202 or equivalent
### Course Descriptions

#### Germanic and Slavic

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<thead>
<tr>
<th>Course ID</th>
<th>Code</th>
<th>Credits</th>
<th>Description</th>
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<tbody>
<tr>
<td>RUSS 312</td>
<td>F 3C 0.5</td>
<td>Theory of Translation</td>
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<tr>
<td>RUSS 311</td>
<td></td>
<td></td>
<td>As RUSS 311</td>
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<tr>
<td>RUSS 341</td>
<td>F 3C 0.5</td>
<td>Russian Drama</td>
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<tr>
<td>RUSS 341</td>
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<td></td>
<td>A study of the origins and development of Russian drama up to 1905. Reading and critical analysis of major works in various genres with emphasis on authors of the nineteenth century. Taught in English. Extra work in Russian required of Russian majors only. Open to all students. Cross-listed as DRAMA 352.</td>
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<tr>
<td>RUSS 342</td>
<td>W 3C 0.5</td>
<td>Russian Drama</td>
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<td>As RUSS 341</td>
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<td>RUSS 342</td>
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<td></td>
<td>Taught in English</td>
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<td>RUSS 342</td>
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<td></td>
<td>Extra work in Russian required of Russian majors only.</td>
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<td>RUSS 342</td>
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<td>Open to all students.</td>
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<td>RUSS 342</td>
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<td>Cross-listed as DRAMA 352.</td>
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<tr>
<td>RUSS 351</td>
<td>F 3C 0.5</td>
<td>Intermediate Conversation and Composition</td>
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<td>RUSS 351</td>
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<td>In principle, this course is a continuation of RUSS 251/252: its terms of vocabulary building, apart from the spoken language, the comprehensiveness of the literary language is especially stressed. Prereq: RUSS 252 or equivalent.</td>
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<tr>
<td>RUSS 352</td>
<td>W 3C 0.5</td>
<td>Intermediate Conversation and Composition</td>
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<td>RUSS 352</td>
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<td>As RUSS 351</td>
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<td>RUSS 352</td>
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<td>Prereq: RUSS 351 or equivalent</td>
</tr>
<tr>
<td>RUSS 356</td>
<td>W 3C 0.5</td>
<td>The Stage as Forum: Russian Drama in Translation</td>
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<td>RUSS 356</td>
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<td>Major Russian dramas will be studied from various points of view, including historical importance, themes, and technique. The course includes theory and selected dramas of such playwrights as Gogol, Chekhov, Tolstoy, Gorky, Mayakovskiy, and Pogodin. Taught entirely in English. Fall term: See GER 355. Open to students from all departments; not normally open to first-year students. Cross-listed as DRAMA 356.</td>
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<tr>
<td>RUSS 361</td>
<td>F 3C 0.5</td>
<td>Russian Short Story</td>
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<td>RUSS 361</td>
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<td>A study of the form and a detailed examination of Russian short stories by major representative writers. Taught in English. Extra work in Russian required of Russian majors only.</td>
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<tr>
<td>RUSS 362</td>
<td>W 3C 0.5</td>
<td>Russian Short Story</td>
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<td>RUSS 362</td>
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<td>As RUSS 361</td>
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<tr>
<td>RUSS 362</td>
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<td></td>
<td>RUSS 361 3C 0.5 The Peoples of the Soviet Union</td>
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<td>RUSS 362</td>
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<td>Especially emphasized will be the study of non-Slav peoples of the Caucasus and Central Asia, European Russia and Siberia. Czarist and Soviet policy towards national minorities; assimilation and integration problems; in the light of linguistic division; development of literary languages. Some achievements of Soviet anthropology.</td>
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<td>RUSS 362</td>
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<td>Open to all students.</td>
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<td>RUSS 362</td>
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<td>Cross-listed as DRAMA 353</td>
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<tr>
<td>RUSS 361</td>
<td>F 3C 0.5</td>
<td>Russian Short Story</td>
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<td>RUSS 361</td>
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<td>As RUSS 362</td>
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<tr>
<td>RUSS 362</td>
<td>W 3C 0.5</td>
<td>Russian Short Story</td>
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<td>RUSS 362</td>
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<td>As RUSS 362</td>
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<tr>
<td>RUSS 381</td>
<td>3C 0.5</td>
<td>The Peoples of the Soviet Union</td>
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<td>RUSS 381</td>
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<td>As RUSS 381</td>
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<tr>
<td>RUSS 382</td>
<td>3C 0.5</td>
<td>The Peoples of the Soviet Union</td>
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<td>RUSS 382</td>
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<td>As RUSS 381</td>
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<tr>
<td>RUSS 391</td>
<td>F 3C 0.5</td>
<td>Great Russian Novels</td>
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<td>RUSS 391</td>
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<td>Reading and interpretation of 19th-century novels selected from the works of Gogol, Turgenev, Dostoevsky, and Tolstoy. Lectures on social and intellectual background. Taught in English. Extra work in Russian required of Russian majors only. Open to all students.</td>
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<tr>
<td>RUSS 392</td>
<td>W 3C 0.5</td>
<td>Great Russian Novels</td>
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<td>RUSS 392</td>
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<td>Reading and interpretation of 18th- and 20th-century novels selected from the works of Gorky, Zamyatin, Pasternak, and Solzhenitsyn. Lectures on social and intellectual background. Taught in English. Extra work in Russian required of Russian majors only. Open to all students.</td>
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<tr>
<td>RUSS 441</td>
<td>3C 0.5</td>
<td>East Slavic Epic Tradition</td>
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<td>RUSS 441</td>
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<td>A study of the origins and development of the Epic tradition in East Slavic Literature. Taught in English. Open to all students.</td>
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<tr>
<td>RUSS 442</td>
<td>3C 0.5</td>
<td>Russian Epic Tradition</td>
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<td>Taught in English</td>
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<td>RUSS 442</td>
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<td>Open to all students.</td>
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<tr>
<td>RUSS 451</td>
<td>F 3C 0.5</td>
<td>Advanced Conversation, Grammar and Composition</td>
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<td>RUSS 451</td>
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<td>As RUSS 451</td>
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<td>RUSS 451</td>
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<td>Prereq: RUSS 451 or equivalent</td>
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<tr>
<td>RUSS 461</td>
<td>F 3C 0.5</td>
<td>20th-Century Russian Literature</td>
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<td>RUSS 461</td>
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<td>Reading, interpretation, and critical analysis of selected fiction and drama (A. B. Bulgakov, Erenburg, Nabokov, Pasternak, Solzhenitsyn). Taught in English. Extra work in Russian required of Russian majors only. Open to all students.</td>
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<tr>
<td>RUSS 462</td>
<td>W 3C 0.5</td>
<td>Twentieth Century Russian Literature</td>
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<td>RUSS 462</td>
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<td>As RUSS 462</td>
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<td>RUSS 462</td>
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<td>Prereq: RUSS 462 or equivalent</td>
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<tr>
<td>RUSS 481</td>
<td>F 3C 0.5</td>
<td>Russian Poetry</td>
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<td>RUSS 481</td>
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<td>As RUSS 481</td>
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<td>Taught in English</td>
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<td>RUSS 481</td>
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<td>Open to all students.</td>
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<tr>
<td>RUSS 482</td>
<td>W 3C 0.5</td>
<td>Russian Poetry</td>
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<td>RUSS 482</td>
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<td>As RUSS 482</td>
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<td>RUSS 482</td>
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<td>Prereq: RUSS 102 or equivalent</td>
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RUSS 485 F 3C 0.5
History of Russian Literature
This course deals with the emergence of the Russian national literature, emphasizing the cultural and intellectual setting from the beginning to 1917. Literary movements and major representative works not studied in other courses will be discussed.

Taught in English
Extra work in Russian required of Russian majors only
Open to all students

RUSS 486 W 3C 0.5
History of Russian Literature
This second part deals with Russian works not studied in other courses. Representative works not studied in other courses will be discussed.

Taught in English
Extra work in Russian required of Russian majors only
Open to all students

RUSS 496-498 F,W,S,J,A R 0.5
Reading Courses In Approved Topics
Prereq: Approval of the Department

UKRAINIAN
UKRAN 101 F 3C,1L 0.5
Beginners' Ukrainian
For students with little or no prior knowledge of Ukrainian. The basic elements of Ukrainian grammar and composition with emphasis on oral practice and pronunciation. Introduction to aspects of Ukrainian culture.

Open to undergraduate students of all departments.
Recommended to graduate students of Russian as a second Slavic language.

UKRAN 102 W 3C,1L 0.5
Beginners' Ukrainian
As UKRAN 101
Prereq: UKRAN 101 or equivalent

UKRAN 201 F 3C,1L 0.5
Intermediate Ukrainian
This course will be conducted largely in Ukrainian and provides intensive practice in grammar, composition and conversation.

Prereq: UKRAN 102 or equivalent
Offered in alternate years

UKRAN 202 W 3C,1L 0.5
Intermediate Ukrainian
As UKRAN 201
Prereq: UKRAN 201 or equivalent
Offered in alternate years

UKRAN 271 F 3C 0.5
Ukrainian Civilization (From the Beginnings to 1800)
This course presents the evolution of Ukrainian civilization from its prehistoric origins to the period of national revival in the late 18th century. Developments in literature, art, architecture, music and the folk arts are examined against the background of Ukrainian history.

Taught in English
Open to all students

UKRAN 272 W 3C 0.5
Ukrainian Civilization (From 1800 to the Present)
This course examines the artistic, intellectual, spiritual, and material progress of the Ukrainian people in the 19th- and 20th-centuries. Integral to this course are the cultural aspects of Ukrainian settlement in Canada. Lectures are complemented by audio-visual presentations and readings from Ukrainian and Ukrainian-Canadian literature.

Taught in English
Open to all students

UKRAN 301 F 3C 0.5
Introduction to Ukrainian Literature
Reading and critical interpretation of texts chosen from the works of Skovoroda, Kotliarevsky, Shevchenko, Franko, L. Ukrainka and others.

Taught in English
Open to all students

UKRAN 302 W 3C 0.5
A Critical Survey of Literary Movements in 20th-Century Ukrainian Literature
With special attention to the rise of the new angry generation of poets of the Sixties (V. Symonenko, L. Kostenko, V. Korolych, and others).

Taught in English
Open to all students

CROATIAN
CROAT 101 F 3C 0.5
Introductory Croatian
For students with little or no knowledge of Croatian. The basic elements of Croatian grammar with emphasis on oral practice and pronunciation, along with appropriate graded texts.

Open to all students

CROAT 102 W 3C 0.5
Introductory Croatian
As CROAT 101
Prereq: CROAT 101 or equivalent

CROAT 201 F 3C 0.5
Intermediate Croatian
This course is a continuation of first-year Croatian. It offers extensive practice in both the spoken and written language. Vocabulary building, comprehension and pronunciation are stressed.

Prereq: CROAT 201 or equivalent

CROAT 202 W 3C 0.5
Intermediate Croatian
As CROAT 201
Prereq: CROAT 201 or equivalent

CROAT 203 F 3C 0.5
Advanced Croatian
This course is conducted in Croatian and provides intensive practice in spoken and written Croatian on the advanced level. Conversation on modern topics will be stressed.
Prereq: CROAT 202 or equivalent

CROAT 301 F 3C 0.5
Advanced Croatian
As CROAT 301
Prereq: CROAT 301 or equivalent

CROAT 302 W 3C 0.5
Advanced Croatian
As CROAT 301
Prereq: CROAT 301 or equivalent
CROAT 371 F 3C 0.5  
Croatian Culture and Literature  
This course presents the evolution of Croatian culture from the beginnings to the present. Particular emphasis is placed on developments in literature, however, other significant manifestations of Croatian civilization (art, architecture, music) are also examined. Integral to this course are the cultural aspects of Croatian settlements in Canada.  
Taught in English  
Open to all students

CROAT 3/2 W 3C 0.5  
Croatian Culture and Literature  
As CROAT 371  
Taught in English  
Open to all students

CROAT 496/497 0.5/0.5  
Special Topics in Croatian Studies  
Prereq: Approval of the Department

GERON 208 W 0.5  
The Literature of Aging  
This course will focus on literary works that present various aspects of aging, such as changes in physical and mental abilities, relationships with children and grandchildren, coping with disease and death, and the satisfactions unique to the elderly.  
Cross-listed as ENGL 208F

GERON 255 W 0.5  
The Biology of Aging  
An introductory study of the biological processes of aging at the molecular, cellular and systemic levels. Topics include an examination of the theories of aging, methods used to study the aging process, the role of diseases and chronological changes in the organism during senescence. In some cases, the instructor may consider waiving the course prerequisite listed.  
Cross-listed as SCI 255

GERON 400 S 0.5  
Multidisciplinary Seminar on Aging  
Faculty and students from various departments meet to discuss individual and population aging from a multidisciplinary perspective. Topics include the definition of aging, the demography of aging, evolutionary and genetic factors, aging as a social process, and human aging patterns. Students wishing to enrol in this seminar must have completed at least six of the courses towards the Certificate and must consult the Director before preregistering.

GERON 401A/B  
Directed Studies in Special Topics  
For the student who desires to pursue a particular topic in depth through independent research and/or extensive reading, a faculty member must approve a student's project prior to registration for this course. Open to exceptional students who have permission of the instructor and the director of the program.

GERON 402 W 2C 0.5  
Epidemiology of Aging  
Factors contributing to various disease processes, with special reference to quantitative evaluation of environmental factors relevant to human disease and aging.

COURSES NOT OFFERED 1991-92  
GERON 403 Epidemiology of Aging 2

Greek

For courses in Greek see Classical Studies.

Health Studies

Undergraduate Officer  
A.M. Myers, BMH 2320, ext. 3664

Introductory Note  
HLTH 101/102 have replaced HLTH 140/141.

HLTH 101 F 3C 0.5  
Introduction to Health Studies 1  
An exploration of current issues and controversies in the promotion of optimal health with emphasis on the biological factors contributing to health or disease. Strategies and procedures for the reduction of risk factors for disease are described. Topical areas include: (1) human reproduction and sexuality, (2) nutritional factors and heart disease, and (3) genetic diseases and cancer.  
Antireq: Students with HLTH 140 and/or 141 may not take this course for credit

HLTH 102 W 3C 0.5  
Introduction to Health Studies 2  
The same as HLTH 101, with emphasis on behavioural factors as they interact with biological processes. The topics will include (1) the neurological bases and (2) the psychological bases of health related behaviour such as stress and addiction and (3) community health.  
Antireq: Students with HLTH 140 and/or 141 may not take this course for credit

HLTH 210 W 3C 0.5  
Growth, Development and Aging  
The physiology of human growth, development and aging is examined, with special reference to the influence of diet, environment, exercise and disease on the normal processes.  
Prereq: BIOL 230, 273 (Formerly BIOL 233)  
Cross-listed as KIN 210
HLTH 220 F 3C,1T 0.5
Health and the Family
The course focuses on the family as the basic social unit responsible for the development and maintenance of the effective physical and mental health of its members. The interaction of biological, psychological, and socio-cultural factors will be considered as the family is examined using a lifespan approach.
Prereq: HLTH 101/102 or 140/141, PSYCH 101 and Recommended SOC 101

HLTH 245 F 2C,1T 0.5
Community Health
This course examines the Canadian health care system by considering organizational principles, health resources, service utilization, health care planning and health promotion strategies. There is a focus on societal and political issues which affect the health of the society through the delivery system.
Prereq: Health Studies students only or permission of instructor

HLTH 340 W 3C 0.5
Environmental Health
An introduction to the basic biological and toxicological processes that determine the effects of environmental pollutants on human health. Emphasis is placed on the mechanisms that give rise to chronic or delayed health effects, such as cancer, genetic mutations, and birth defects.
Prereq: KIN 317 or equivalent

HLTH 341 F 3C 0.5
Disease Process
An introduction to the study of biological factors governing the occurrence of disease in humans, using selected diseases to illustrate disease mechanisms and identification of risk factors. The means by which disease is induced and the host response are emphasized. The role that behaviour has in modifying biological response to disease is also considered.
Prereq: BIOL 230, 273 (Formerly BIOL 233), KIN 317 or equivalent

HLTH 344 W 3C 0.5
Program Evaluation
A comprehensive and systematic introduction to the key concepts, methodologies, and issues related to program evaluation in general and their application to health programs in particular. Administrative and policy implications as well as the technical/methodological evaluation issues that face individuals involved in administering, planning, implementing, and evaluating health programs will be discussed.
Prereq: Basic courses in Statistics and in Research Design

HLTH 346 W,S 3C 0.5
Nutrition
An elementary course in nutrition with special emphasis on diet for sport and certain physiological conditions.
Cross-listed as KIN 346

HLTH 348 W,S 3C 0.5
Social Psychology of Health Behaviour
The study and application of basic social psychological processes in relation to selected health-related behaviours (e.g. family planning, overeating, smoking, non-medical drug use, cardiovascular risk factors, patient compliance, medical care utilization).
Prereq: PSYCH 101 or consent of instructor
Cross-listed as KIN 348

HLTH 349 F,S 3C 0.5
Principles of Behaviour Modification
An overview of behaviour modification principles and procedures. Basic principles of reinforcement, punishment, modelling and desensitization are examined as they relate to health behaviour.
Prereq: PSYCH 101 or consent of instructor
Cross-listed as KIN 349

HLTH 350 F 2C,2S 0.5
Occupational Health
Methodological approaches to the detection, assessment and management of toxic hazards (especially carcinogens) in the workplace and external environment. The health effects of chemical toxicants on specific human organ systems (lung, nervous system, immune system, etc.) are also examined.
Prereq: HLTH 340, or permission of instructor

HLTH 407 W 3C 0.5
Physiology of Coronary Heart Disease
An examination of the pathology, risk factors and rehabilitation programs related to coronary heart disease. Major emphasis is placed on the cardiorespiratory implications of exercise in the rehabilitation process.
Prereq: KIN 300 or permission of instructor
Cross-listed as KIN 407

HLTH 431 F,W,S 0.5
Research Project
An independent research project on an approved topic, supervised by a faculty member. Includes an approved proposal and completion of the first 3 chapters of the thesis - Introduction, Review of Literature, and Methods.
Recommended for students planning graduate studies.
Offering is contingent on the availability of resources.

HLTH 432 F,W,S 0.5
Research Project
An independent research project on an approved topic, supervised by a faculty member. Includes data collection, data analysis and presentation of results in thesis form.
Prereq: Completion of HLTH 431
Recommended for students planning graduate studies.
Offering is contingent on the availability of resources.

HLTH 433 F 0.5
Advanced Research Project
A course designed to familiarize students with the skills requisite for the formulation, execution and written presentation of an empirical research project. After a general discussion of the pertinent issues, students will be asked to analyse independently a data set related to a topic of interest to Health Studies students and to present this in the form of a research report.
Prereq: KIN 222, 330 and CS 316
Students must be enrolled in either fourth-year regular or 3B Co-op of the Health Studies program.

HLTH 442 F 3C 0.5
Epidemiology of Chronic Diseases
An investigation of the epidemiology of selected chronic non-communicable diseases. The course emphasizes understanding of epidemiologic methods and identification of risk factors.
Prereq: An introductory statistics course or consent of instructor
HLTH 443 W 3C 0.5
Behaviour and Chronic Disease
A critical analysis of various behavioural strategies for the prevention of coronary heart disease, hypertension, chronic obstructive pulmonary disease, and lung cancer. The role of behaviour in the pathogenesis of disease and the feasibility of behavioural change for prevention of disease will be discussed.
Prereq: HLTH 344, 348, 349

HLTH 445 W 3C 0.5
Seminar in Health Promotion
A study of current issues pertaining to health promotion, health behaviour, or biomedical research. Topics may include pertinent research that is significant to the health of individuals, families and groups, or the community.
Prereq: Health Studies students only. Normally only fourth-year students will be admitted.

HLTH 472 F,W,S 0.5
Independent Study
For the student who desires to pursue a particular topic in depth through guided independent research and/or reading. A faculty member must approve a student's project prior to registration. May be repeated in subsequent terms. Depending on student demand and availability of teaching resources, special topics may be presented to small groups in a lecture format. Such topics have included Pharmacology, Behavioural Immunity, Nutrition, The Health Care System.
Prereq: Consult with the Department

HIST 100 F 0.5
Landmarks in World History
A thematic introduction to the development of the world's major civilizations.

HIST 102C W 0.5
The Origins of Wars in the Twentieth Century
An analysis of the diplomatic, political, economic, ideological, social and cultural explanations of the causes of the major wars of this century with special emphasis on Canada.

HIST 102E F,W 0.5
Canadian History
Selected major themes from pioneer life to Canadian involvement in 20th century wars.
Offered at St. Jerome's College

HIST 102F W,S 0.5
An Introduction to Western Intellectual History Since the Renaissance
An exploration of some of the questions and answers posed by thinkers on the human predicament from Renaissance and Reformation times to the modern period. Readings range from Luther to J.P. Sartre, Shakespeare to Marx and Freud.
Taught in French in the 1992 Spring Term.

HIST 102M F 0.5
Law and Society in the Middle Ages: 500-1000
A study of the laws and legal procedures of the Early Middle Ages. Anglo-Saxon and Germanic law will be examined along with legal procedures and institutions of that era.
Offered at St. Jerome's College

HIST 130 W,S 0.5
The Modern World in Historical Perspective
This course will introduce students, through interrelationships and interaction of selected themes, to contemporary history. Its format includes two interpretive lectures per week plus major films on 20th century crises and discussion groups.

HIST 200 W 0.5
Twentieth Century History as Documented by Films
A history of the 20th century through films. The First World War, Europe between the Wars, the Second World War, North American society in the 20th century and other political, moral and social themes will be explored.

HIST 204 F 0.5
Life on the Ontario Frontier
The course examines the cultural, moral, social and economic adaptations of European settlers to the Upper Canadian frontier environment.

HIST 210 F 0.5
History of Law
An historical introduction to law in the Ancient world, Babylonian, Assyrian, Hittite and Roman law and legal practices and concepts will be examined.
Offered at St. Jerome's College

HIST 211 F 0.5
British History to 1603
A survey of the main stages in the transition of Britain from a remote province of the Roman Empire to a prominent state of post-Reformation Europe. Within the chronological framework, political and constitutional as well as ecclesiastical and social developments will be examined.
This course is primarily intended for non-history majors. History majors may wish to take one or more of HIST 305, 307 and 308

HIST 212 W 0.5
British History Since 1603
A survey of the shaping of British society and the British experience from the time of Shakespeare to the present; constitutional conflict and compromise, rise and fall of empire, industrial and urban revolution, world wars and welfare state.
This course is primarily intended for non-history majors. History majors may wish to take one or more of HIST 305, 307 and 308

HIST 215 F 0.5
The Proper Sphere: Canadian Women in Historical Perspective
This course will examine the history of women in Canada from New France to the present day. The course will focus on the inter-relationship between women and their society, particularly as it affects the issues of work, health, reform and legal status.
HIST 218 F 0.5
German History 1740-1945
The development of Germany from the
Austrian-Prussian rivalry of 1740
through to the end of World War II.
Offered at Conrad Grebel College

HIST 219 W 0.5
Survey of Russian History
An introductory survey treating the
historical themes that contributed to the
emergence of Russia, the Russian
Empire, and the Soviet Union. Lectures,
films and special presentations.

HIST 221 F,S 0.5
Race Relations in Canada: An
Historical Perspective
The "race problem" has appeared on the
Canadian public agenda for the
1980's, but the issue is not of recent
origin. This course will examine Euro-
Canadian attitudes and practices
toward non-European minorities from
pioneer times to the present, and will
set racial policies in the context of the
evolution of a Canadian national
identity.

HIST 222 W 0.5
History of Modern Revolutions
An introduction to historical explana-
tions of revolutions with special focus
on social change and revolutionary
theories. The French, Russian and
Chinese Revolutions will be used as
case studies.
Offered at Conrad Grebel College.

HIST 235 F 0.5
History of Christianity
The development of Christianity in its
Roman Catholic, Eastern Orthodox and
Protestant traditions from the time of
Christ to the present.
Offered at St. Jerome's College.
Cross-listed as R S 230

HIST 239 F 0.5
History of Modern China, 1911 to the
Present
Some of the topics studied in this
course include: the three stages of
warlordism, the May Fourth Movement
and the structure of society in the
People's Republic of China.

HIST 240 W 0.5
Twentieth-Century Japanese History
This course will examine the historical
influences, both domestic and foreign,
which led Japan to follow the course
which has brought it to the present
status of a powerful Asian nation.

HIST 241 S,W 0.5
Society and the Sexes in Early
Modern Europe
This course will examine the changing
importance of gender roles from the
15th to the 18th centuries. It will focus
on topics such as sexuality, marriage,
the family and the role of women in
society and the work force.

HIST 247 F 0.5
Mennonite History: A Survey
This course covers Mennonite origins,
teachings, migrations, settlement
patterns, divisions, leaders, institutions,
and religious and social practices,
indeed all facets of Mennonite history in
various national settings.
Offered at Conrad Grebel College.

HIST 249 F 0.5
History of Canadian-American
Relations Since 1914
An examination of the history of rela-
tions between the two countries since
1914. Topics of a political, economic,
social and cultural nature will be
studied.

HIST 250 F 0.5
The Art and Craft of History
This course will provide a collegial
learning setting within which students
will be introduced to techniques of
historical writing and research, and
some examples of the best of recent
historical scholarship.
Highly recommended for Year Two
History majors.

HIST 253 F 0.5
Canadian History: The Colonial
Period
This course examines the major
themes in pre-Confederation Canadian
history including the rise and fall of New
France, the creation of British North
American societies in the Maritimes and
Upper Canada and economic and poli-
tical development.
Offered at St. Jerome's College.

HIST 254 W.S 0.5
Canadian History: The National
Period
This course examines Confederation,
the rise of political parties, Canadian
external relations, western discontent,
the impact of both world wars and poli-
tical and economic changes in Canada
since 1945.
Offered at St. Jerome's College.

HIST 255 F 0.5
The Expansion of England
The history of the British Empire down
to the American War of Independence,
telling the story of the Tudor seadogs,
of the plantation of Ireland, the settle-
ment of the North American mainland,
the establishment of slave plantations
in the Caribbean, and the earliest
British enterprises in Africa, Asia and
the Pacific.

HIST 256 W 0.5
The British Empire and
Commonwealth
The history of British imperialism
between the loss of the American colo-
nies and the Falklands Islands War of
1982, tracing the rise of the settlement
colonies to dominion status, the huge
expansion of the dependent empire
during the age of the New Imperialism,
the imperial apogee after World War I,
and the rapid change from Empire to
New Commonwealth after World War II.

HIST 257 F 0.5
The United States to 1900
From the British provincial society of
the 18th century to the emergence of
modern America. Special emphasis on
the American character, and on the
moral dilemmas of republicanism and
democracy, freedom and slavery,
equality and competition.

HIST 259 W 0.5
Modern African History
An issue-oriented examination of some
of the major developments in African
political, social and economic history in
the 20th century.

HIST 260 F 0.5
Europe: 814-1903
The political, cultural, economic and
ecclesiastical development of Europe
from Charlemagne to Philip IV of
France.
Offered at St. Jerome's College

HIST 263 S, W 0.5
Europe: 1789-1945
The growth of nationalism and nation
states since the French revolution with
attention to the Industrial Revolution,
the World Wars, Fascism, Nazism and
Stalinism.
Taught in French in the 1991 Spring
term.
Course Descriptions

History

HIST 273 F 0.5
**Canadian Social History I**
This course will cover the period from the early settlement of Canada to the beginnings of urban industrial development. Focus will be on the experiences of Canadians in their daily lives.

HIST 274 W 0.5
**Canadian Social History II**
The social and cultural development of Canada from the late nineteenth century to the present day.

HIST 300 W 0.5
**The Idea of History**
The course is an introduction to the Philosophy of History and to historiography from the 19th century to the present. It deals with the great theoretical issues influencing historical analysis and with the classics of historical literature.

Highly recommended for Year Three History majors.

HIST 304 F 0.5
**Medieval Church History**
An exploration of the development of the Church from 604 to 1449. Topics will include leadership struggles in church and state, crusades, heresy and inquisition, the western schism and the conciliar period.

Offered at St. Jerome's College
Cross-listed as H S 325

HIST 307 F 0.5
**British History 1700-1967**
A study of people, power, thought and culture in the world's first industrializing society.

HIST 308 W 0.5
**Britain Since 1867**
A study of the British experience and of Britain's part in world history from the 1860's to the 1960's.

HIST 321 W 0.5
**Race Relations in Modern History: Case Studies**
A detailed analysis of topics in the history of race relations intended primarily for students who have completed HIST 221 or other background to the subject. Special attention will be paid to revolutionary developments since World War II, and to the emergence of modern human rights policies.

HIST 325 F 0.5
**History of Canadian Indians to 1870's**
"From Freedom to Conquest". The history of Indian-white contact and its effect on the life and culture of the native Canadians.

HIST 326 W 0.5
**History of Canadian Indians Since 1870's**
"Life under coercion" and the "New Indian". The history of Indians on reserves and under government administration. Contemporary themes and issues of concern to native people are examined.

HIST 339 F 0.5
**The History of France in the Nineteenth Century**
A study of French society and the four revolutions that influenced it with particular attention to social and institutional forces.

HIST 340 W 0.5
**Europe: 1789-1914**
This course will examine European society amidst the dramatic changes of the nineteenth century. It will consider class, the family, gender, religion, and institutions during this century of political and social transformation.

HIST 346 W 0.5
**Mennonite History: Special Topics**
A study of the Mennonite experience in Russia.

Offered at Conrad Grebel College

HIST 348 W 0.5
**The Radical Reformation**
A study of 16th century Anabaptism — a religious Reformation movement dissenting from both Protestantism and Roman Catholicism — its origins, its social political and theological content; and its relationship to such independent dissenters as Sebastian Franck.

Offered at Conrad Grebel College

HIST 350 W 0.5
**British West Indian History**
A survey history of the British Caribbean, widely defined. Topics emphasized include early colonization, plantations, slave society, abolition and emancipation, the growth of nationalism, independence, and the roots of contemporary problems.

HIST 355 F 0.5
**Russian History to 1900**
The course will focus on selected themes in the development of Muscovite and Imperial Russia from pre-tsarist times to the beginning of the 20th century.

HIST 356 W 0.5
**20th-Century Russia**
The course will focus on selected themes in Russia’s development in the 20th century including the Soviet period.

HIST 359 W 0.5
**The History of Modern Germany: From the Weimar Republic to Reconstruction**
A study of Germany from the rise of the Nazis through the War experience, the post-War settlement, the integration of the refugees, the division into East and West, and the economic miracle.

Offered at Conrad Grebel College.

HIST 379 F 0.5
**Reformation History**
A study of the major sixteenth-century reformers and their intellectual background in humanism and late medieval scholasticism. Special attention will be given to the Lutheran and Reformed traditions and their ideological, social, political expressions.

Offered at Conrad Grebel College.

HIST 385 W 0.5
**Canada: From MacDonald to Laurier**
An analytical and historical examination of the development of the Canadian nation from Confederation to the First World War.

Offered at St. Jerome's College

HIST 387 W 0.5
**Ontario History since Confederation**
The course will examine the emergence of Ontario as an industrial giant and the development of its hegemony in Canada. An emphasis will also be placed on the sources and methods of local historical research.

HIST 389 W 0.5
**Canada in World Affairs: From Laurier to Trudeau**
An analytical and historical examination of Canadian foreign policy in the international system. Domestic sources of Canadian foreign policy and international sources of Canadian foreign policy are examined in detail.

HIST 396 W 0.5
**The History of the American South**
This course traces the main eras and issues in Southern history from the 16th century to the mid-20th century. Topics examined will include pre-revolutionary and ante-bellum South, the Trial of Tears, the Civil War and reconstruction, the New South, the "lost cause", the era of Jim Crow, and the search for the central theme.
Course Descriptions

Independent Studies

HIST 397 F,W,S 0.5
Directed Studies in Special Topics
Study in a limited field under tutorial guidance. A high standard of written work will be expected.

HIST 398 F,W,S 0.5
Directed Studies in Special Topics
Study in a limited field under tutorial guidance. A high standard of written work will be expected.

400 LEVEL:
Senior Seminars
Each term of a senior seminar counts 1.0 credit. Seminars with the suffix “A” are reading seminars designed to give students an extensive acquaintance with scholarship in a particular field of history. Seminars with the suffix “B” are research seminars in which students will engage in research on particular topics in that field. Students should preregister for senior seminars, and for HIST 491, Independent Study in Special Subjects.

HIST 400A/B F,W 1.0/1.0
Reformation

HIST 401A/B 1.0/1.0
European

HIST 402A W 1.0
Russian

HIST 403A/B 1.0/1.0
Canadian

HIST 405A/B 1.0/1.0
British

HIST 407A/B 1.0/1.0
Imperial

HIST 409A/B 1.0/1.0
American

410A/B CREDITS 1.0/1.0
Historiography

HIST 491 F,W,S 1.0
Independent Study in Special Subjects

COURSES NOT OFFERED 1991-92

HIST 102K Conflict in the Caribbean and Central America
HIST 102N Introduction to African History
HIST 201 Canadian Urban History
HIST 201 The Individual and the Family in History
HIST 203 Modern Quebec
HIST 206 History of Canadian Minorities
HIST 206 Canadian Labour History
HIST 208 The Cold War: American-Russian Relations Since November, 1917
HIST 209 Health, Disease and Medicine in Canadian History, 1500-1984
HIST 213 Modern Western Popular Culture
HIST 216 Irish History: Achievement, Unification, Revolution
HIST 217 Irish History: The Nineteenth and Twentieth Centuries
HIST 230 Church and Revolution in Latin America
HIST 232 Revolutions in Latin America
HIST 233 Civil-Military Relations in Latin America
HIST 234 The Catholic Church in Canada Since Confederation
HIST 237 Ancient Civilization I
HIST 238 Ancient Civilization II
HIST 245 Religious and Cultural Minorities in Canada
HIST 248 History of Canadian-American Relations to 1914
HIST 261 Europe: 14th to 16th Century
HIST 262 Europe: 16th to 18th Century
HIST 305 The English Reformation
HIST 319 French-Canadian History
HIST 320 The History of Modern Quebec
HIST 329 History of the Common Law
HIST 342 Mystical and Utopian Movements from the 12th to the 17th Century 1
HIST 344 Mystical and Utopian Movements 2
HIST 345 Minorities in International Perspective

Independent Studies

Undergraduate Officer
G. Griffin, PAS 1054, ext. 6147

IS 101A F,W,S 1S 0.5
Introductory Independent Research
Each half credit will involve one seminar a week devoted to the philosophy, methodology and practicality of carrying out independent study. Emphasis will be placed upon such different forms of independent study as self-directed learning, problem posing, and critical thinking. In addition, each student enrolled in the course will spend at least seven hours a week of independent research supervised by an IS faculty member or by a consenting supervisor from any of the other academic units on campus.

Prereq: IS students must be in good standing. Non-IS students must be in good standing in an Honours program. Consent of instructor

IS 101B 1.0
Same as above

IS 101C 1.5
Same as above

IS 101D 2.0
Same as above

IS 101E 2.5
Same as above

IS 102A,B,C,D,E F,W,S 1S 0.5 to 2.5
Introductory Independent Research Continued
Criteria as above.

Prereq: IS 101 and/or consent of instructor

IS 301A,B,C,D,E F,W,S 1S 0.5 to 2.5
Advanced Independent Research
Each half credit will involve regular meetings with a designated faculty member and at least seven hours a week of independent research on a topic of particular interest to the student and faculty member.

Prereq: IS 101 or 102 or evidence of ability to undertake advanced individual research and consent of instructor
Course Descriptions
Interdisciplinary Social Science — Kinesiology

IS 302A,B,C,D,E F,W,S 1S 0.5 to 2.5
Advanced Independent Research Continued
Criteria as above
Prereq: IS 301 and/or consent of instructor

Interdisciplinary Social Science
For courses in Interdisciplinary Social Science see Social Development Studies.

Italian

Undergraduate Officer
V. Golini, St. Jerome's College,
884-8110

Courses not offered in the current academic year are listed at the end of this section.

THE FOLLOWING COURSES ARE ADMINISTERED BY ST. JEROME'S COLLEGE.

ITAL 101 F,W 3C,1L 0.5
Introduction to Italian Language 1
An intensive study of the fundamentals of grammar and conversation. The language laboratory will be used.

ITAL 102 W 3C,1L 0.5
Introduction to Italian Language 2
A continuation of ITAL 101, with more emphasis on conversation and everyday uses of language.
Prereq: ITAL 101 or consent of instructor

ITAL 191 F 3C,1L 0.5
Intermediate Italian 1
Advanced study of grammar. Conversation sessions will be based on intermediate level readings reflecting contemporary Italian life. Short works by modern writers will also be studied.
Prereq: ITAL 101/102 or consent of instructor

ITAL 192 W 3C,1L 0.5
Intermediate Italian 2
A continuation of ITAL 191 with emphasis on discussion of modern texts as illustrations of the creative possibilities and the limitations of the language.
Prereq: ITAL 191 or consent of instructor

ITAL 251 F 3C 0.5
Italian Conversation and Composition 1
This course offers extensive practice in idiomatic spoken and written language. Conversation will be based on social, political and cultural aspects of Italian life.
Prereq: ITAL 191/192 or consent of instructor

ITAL 252 W 3C 0.5
Italian Conversation and Composition 2
A continuation of ITAL 251 with more emphasis on composition based on articles from present day newspapers and magazines.
Prereq: ITAL 251 or consent of instructor

ITAL 291 F 3C 0.5
Italian Culture and Civilization 1
A survey of developments in Italian culture — history, literature and the arts — up to and including the Renaissance.
Prereq: Second-year standing Taught in English

ITAL 292 W 3C 0.5
Italian Culture and Civilization 2
A survey of developments in Italian culture — history, literature, painting, and music — in the post-Renaissance period, with emphasis on modern Italy.
Prereq: Second-year standing Taught in English.

ITAL 311 F 3C 0.5
Medieval Italian Literature
An introduction to the Italian literature of the Middle Ages, with special reference to selections from the major works by Dante, Petrarch and Boccaccio.
Prereq: ITAL 191, 192 or consent of the instructor

ITAL 396 F 3R 0.5
Special Topics/Directed Readings
This course gives the student an opportunity to study authors and works of special interest which are not covered in other courses.
Prereq: Consent of the instructor

ITAL 397 W 3R 0.5
Special Topics/Directed Readings
Winter term of ITAL 396

COURSES NOT OFFERED 1991-92
ITAL 312 Renaissance Italian Literature
ITAL 391 The Modern Italian Novel

Japanese

For courses in Japanese see East Asian Studies.

Kinesiology

Undergraduate Officer
I.D. Williams, BMH 3024, ext. 2825

KIN 102 F 3C,1T 0.5
Biophysical Basis of Kinesiology
Human physical movement is discussed from mechanical, anatomical and physiological viewpoints. The course provides a general orientation to the study of Kinesiology.

KIN 103 F 3C,1T 0.5
Psycho-Social Basis of Kinesiology
An introduction to the study of human physical activity from psychological, sociological, anthropological and historical perspectives.

KIN 200 F 3C,2L 0.5
Human Anatomy of the Limbs and Trunk
Functionally-oriented study of the limbs and trunk by regions using predissected cadavers. A brief introduction to Neuroanatomy is included.
No Year One students are admitted.
KIN 201 W 3C,2L 0.5
Human Anatomy of the Brain, Head and Neck
The anatomical structure and function of the brain, cranial nerves and sense organs of the head are emphasized. Included is an introduction to the histology of the nervous system. An opportunity for some dissection of the head and neck is provided.
Prereq: KIN 200 or consent of instructor

KIN 210 W 3C 0.5
Growth and Development, and Aging
The physiology of human growth, development and aging is examined with special reference to the influence of diet, environment, exercise and disease on the normal processes.
Prereq: KIN 200, BIOL 230 and 273 Cross-listed as HLTH 210

KIN 222 F 3C,2L 0.5
Statistical Techniques Applied to Kinesiology
An introduction to descriptive and inferential statistics and the interpretation of data. A major consideration of the course is the use of statistics in the solution of problems in Kinesiology and Health Studies.
Prereq: KIN and Health Studies students only

KIN 242 F 3C,2L 0.5
Introduction to Movement Disorders
An introduction to selected movement disorders and their implications for physical activity. The movement disorders examined include those which accompany neuromuscular and perceptual-motor impairment, mental retardation, cardiovascular and respiratory disease.
Prereq: KIN 102 and 103

KIN 255 W 3C,2L 0.5
Introduction to Psychomotor Behaviour
An information processing approach is used to introduce the principles of learning and performing fine and gross motor skills. In addition, social psychological variables are studied as they relate to the facilitation or decrement in learning and performance.
Prereq: KIN 103 and PSYCH 101

KIN 264 F 2C,1T
Developmental Aspects of Movement
A study integrating the theoretical and applied aspects of motor and perceptual-motor development in children and adolescents. Tutorials will examine children in an applied setting.
Prereq: KIN 200 or consent of instructor

KIN 300 F,S 3C,3L 0.5
Physiology of Physical Activity
A study of the effects of physical activity on the muscular, circulatory and respiratory systems and the mechanisms through which the body adapts to activity and environment.
Prereq: BIOL 230 and 273

KIN 317 F 3C 0.5
Human Biochemistry
An elementary course in human biochemistry including the metabolism and function of proteins, carbohydrates, lipids, and hormones. Emphasis is placed on the application of biochemical principles to human movement.

KIN 321 W,S 3C,2L 0.5
Introduction to the Biomechanics of Human Movement
Anatomical, neural and mechanical considerations in the qualitative and quantitative analysis of human movement are examined. Concepts related to the biomechanics and biodynamics of linked segment models of human motion are introduced.
Prereq: PHYS 103, KIN 200 and 222

KIN 330 W,S 3C 0.5
Research Design
An introduction to the basic principles of scientific inquiry in Kinesiology. A systematic treatment of the logic and practice of methods and techniques employed in research related to physical activity with an examination of design, sampling, data gathering and analysis.
Prereq: KIN 222

KIN 335 W,S 3C,2L 0.5
Evaluation of Human Motor Performance
The nature and methodology of assessment is reviewed from the theoretical and empirical perspectives. Taxonomies of motor performance are examined and principles developed for the measurement of specific constructs in field and laboratory situations.
Prereq: KIN 222

KIN 340 F 3C,2L 0.5
Injuries in Work and Sport
An introductory course to the area of sports medicine in which injuries encountered in sport and in the workplace are examined. Materials covered include the mechanisms of injury, tissue biomechanics, pathology, assessment, treatment and prevention of acute and chronic trauma. The laboratory component provides hands-on experience with the management of simulated injuries.
Prereq: KIN 200, third- and fourth-year Kinesiology students

KIN 346 W,S 3C 0.5
Nutrition
An elementary course in nutrition with special emphasis on diet for sport and certain physiological conditions. Cross-listed as HLTH 346

KIN 348 W,S 3C 0.5
Social Psychology of Health Behaviour
The study and application of basic social psychological processes in relation to selected health-related behaviours (e.g. family planning, overeating, smoking, non-medical drug use, cardiovascular risk factors, patient compliance, medical care utilization). Cross-listed as HLTH 348

KIN 349 F,S 3C 0.5
Principles of Behaviour Modification
A course providing a general overview of behaviour modification principles and procedures. Basic principles of reinforcement, punishment, modelling and desensitization are examined as they relate to health behaviour.
Prereq: PSYCH 101 or consent of instructor
Cross-listed as HLTH 349
An independent research project on an approved topic, supervised by a faculty member. This is the completion of the research proposed in KIN 431. The student's project prior to registration. May be repeated in subsequent terms.

KIN 432 F,W,S 0.5
Research Project
An extensive critical review of the literature on an approved topic. The topics will be broader in scope than those associated with specific research proposals.

KIN 433 F,W,S 0.5
Senior Essay
An extensive critical review of the literature on an approved topic. The topics will be broader in scope than those associated with specific research proposals.

KIN 434 F,S 3C 0.5
Sport in Society
An advanced course in the sociology of sport with a particular focus on sport in Canadian society. Topics include the structure and processes of Canadian sport and its place in Canadian social structure and culture.

Prereq: KIN 152

KIN 452 F,S 3C 0.5
The Psychology of Sport and Physical Activity
An introduction to specific psychological topics as they relate to the social psychological behaviour of the individual in motor performance situations. Topics usually examined are personality, anxiety, motivation, attribution.

Prereq: KIN 354

KIN 453 F,S 3C 0.5
Cognitive Dysfunction and Motor Skill
An examination of issues related to understanding the cerebral organization of motor skill. Discussion of how certain movement disorders are a reflection of disturbances at different stages in the sequence of information processing.

Prereq: One of PSYCH 206, 207, or KIN 356

KIN 454 F 3C 0.5
Seminar in Kinesiology
An examination of current major issues and trends in Kinesiology. Students select areas of major interest from a series of faculty introduced topics.

Prereq: Fourth year Honours KIN students

KIN 455 F 3C 0.5
Directed Study in Special Topics
For the student who desires to pursue a particular topic in depth through guided independent research and/or reading. A faculty member must approve a student's project prior to registration. May be repeated in subsequent terms.

Prereq: Consent of department

KIN 491 F,W 5T 0.5
Clinical Kinesiology - Sports Injuries Assessment
Practical experience in the examination, diagnosis, and treatment of sports injuries under the supervision of a physician and an athletic therapist.

Prereq: KIN students only. Must have at least A- in KIN 200 and 340, first aid and athletic injury experience, and consent of instructor

KIN 492A/B F,W 2T 0.25/0.25
Clinical Kinesiology - Cardiac Rehabilitation Practicum
Practical experience with cardiac patients in a rehabilitation setting; major emphasis is placed on the cardio-respiratory implications of exercise and behaviour modification.

Prereq: KIN 300, 407, 349, and experience with high risk patients, plus consent of instructor

Courses may be taken concurrently.

KIN 493 W 5P,3T 0.5
Clinical Kinesiology: Movement Assessment Practicum
Practical experience in movement assessment of persons from various special populations such as the normal elderly and those with neurological, degenerative or developmental disorders. Motor functions involving gait, posture and balance or upper limb movements will typically be examined in these assessments.

Prereq: Normally the minimum requirement will be a 75% average overall and in the prerequisite courses which include KIN 242, 416, 422, 456. As well, the student will need to have the equivalent of eight months of full-time experience working with people from special populations and the consent of the course co-ordinator.
Management Sciences

Undergraduate Officer
J.B. Moore, CPH 4303, ext. 4036

M SCI 211 F,W,S 3C 0.5
Organizational Behaviour 1
Introduction to the concepts of learning, person perception, attitudes and motivation in an organization. Consideration of communication, roles, norms and decision making within a group. Discussion of power, control, leadership and management in light of the above concepts.

M SCI 251 F,W 3C 0.5
Probability and Statistics 1

M SCI 261 F,W,S 2C,1T 0.5
Managerial and Engineering Economics 1
This course is designed to satisfy Engineering Economics requirements of the Canadian Accreditation Board. Price and output decisions. Choosing among alternative inputs and production processes. Evaluating alternative investments, equipment service life, and new products.

M SCI 311 F,W 3C 0.5
Organizational Behaviour 2
Macro theories of organization and organizational processes are discussed. First half of course examines the development of organizational theories. The second half discusses organizational processes such as conflict and communication control. Throughout, an effort is made to relate course material to organizational structures.

M SCI 331 F,W,S 3C 0.5
Operations Research 1

M SCI 431 W 3C 0.5
Operations Research 2
Classification of stochastic processes. Recurrent events including birth and death processes, and branching processes. Waiting line models and applications. Markov processes and decision problems. Applications include inventory control, reliability, equipment replacement, maintenance, design of service facilities, etc.

Prereq: M SCI 251 or equivalent and M SCI 331

M SCI 432 W,F,W,S 3C 0.5
Introduction to Production Management
Introduction to a number of problem areas in the management of production/industrial engineering. Topics chosen from production planning and inventory control, planning/ control of large projects, quality control, reliability/maintenance, facilities layout, job design, production standards and work measurement.

Prereq: M SCI 331

M SCI 441 W 3C 0.5
Management of Information Systems
Structures, functions and processes of development of computer hardware, software and databases for the management of information. Concepts of information, humans as information processors, information management concepts, introduction to information systems analysis.

M SCI 452 W 2C,1T 0.5
Decision Making Under Uncertainty

Prereq: M SCI 251 or equivalent

M SCI 461 S,F 2C,1T 0.5
Managerial and Engineering Economics 2
The course is concerned with cost minimizing choices of inputs to production. Topics to be considered are: production functions and cost functions; the relation between "size" and unit cost; labour inputs, labour as a quasi-fixed input; productivity measurement; learning-by-doing; capital inputs, investment rules, capacity decisions under scale economies.

Prereq: M SCI 261 or equivalent

Mathematics

(See also Actuarial Science, Applied Mathematics, Combinatorics and Optimization, Computer Science, Mathematics Electives, Pure Mathematics, Statistics.)

Undergraduate Office
MC 5115, ext. 3905

Introductory Notes

1. Courses with the following prefixes are offered by the Faculty of Mathematics: ACTSC (Actuarial Science), AM (Applied Mathematics), C&O (Combinatorics and Optimization), CS (Computer Science), MATH (non-departmental Faculty courses), MTHEL (Mathematics Elective), PMATH (Pure Mathematics), STAT (Statistics). The course descriptions appear in ascending order by course number within these groups. Unless otherwise indicated with the course description, and provided space is available (see Section 6.3 on page 13:36), these courses are normally open to students in any UW faculty, subject to stated prerequisite requirements (see Section 6.4 on page 13:38).

2. A number of mathematics courses are offered at three different levels for BMath degree credit to accommodate the wide variety of students interested in such courses. The most challenging level, Advanced, is intended for exceptionally gifted students in an Honours program. The second level, Honours, is intended for all Honours students not taking the Advanced courses. The third level, General, is intended for students registered in the three-
Courses not offered in the current academic year are listed at the end of this section.

MATH 010 F,W,S 0.0  
Non-Credit Year One Testing Slot  
All students enrolled in one or more of MATH 135, 136, 137, 138, 145, 146, 147, 148, and CS 131, 132 are automatically enrolled in a non-credit lab that is scheduled one evening each week from 7:00 to 9:00 p.m. This time slot appears as a MATH 010 entry on student timetables and is reserved for mid-term tests in the above courses. This time slot is used only on those evenings when mid-term tests are scheduled.

MATH 020 F,W,S 0.0  
Non-Credit Year Two Testing Slot  
All students enrolled in any second-year mathematics course offered by the Faculty of Mathematics, with the exception of various service courses designed for students in other faculties, are automatically enrolled in a non-credit lab that is scheduled from 4:30 to 6:30 p.m. Tuesday and Thursday each week. This time slot is used only on those days when mid-term tests are scheduled.

MATH 103 F 3C,1T 0.5  
Introductory Algebra (For Arts or Social Science Students)  
An introduction to applications of algebra to business, the behavioural sciences, and the social sciences. Topics will be chosen from set theory, permutations and combinations, binomial theorem, probability theory, systems of linear equations, vectors and matrices, mathematical induction.  
Prereq: Grade 12 Mathematics or equivalent.

MATH 104 W 3C,1T 0.5  
Introductory Calculus (For Arts or Social Science Students)  
An introduction to applications of calculus in business, the behavioural sciences, and the social sciences. The models chosen will include the study of polynomial, rational, exponential and logarithmic functions; elementary analytic geometry; linear and quadratic systems of equations. The major concepts introduced to solve problems are: rate of change; optimization; growth and decay; and integration.  
Prereq: Grade 12 Mathematics or equivalent.  
Not open to students in the Faculties of Engineering, Mathematics or Science, or to other students who have credit in Grade 13/OAC Calculus or the equivalent.

MATH 106 F 3C,1T 0.5  
Mathematics For Kinesiology  
Students  
Algebraic functions and their graphs; exponential and logarithmic functions; elementary differential and integral calculus; applications and problems associated with kinesiology.  
Antireq: MATH 134A, 135A, 116, 130A, 137, 140A, 147  
Not open to students in the Faculty of Mathematics.

MATH 111A F 3C,1T 0.5  
Algebra  
Elementary number theory, number systems, mathematical induction, binomial theorem, complex numbers, polynomials.  
Prereq: Grade 12 Mathematics or equivalent.  
Grade 13 or OAC Algebra is recommended but not required.  
Antireq: MATH 134A, 135, 144A, 145  
This course is designed for students in the Faculties of Arts and Science and students in the three-year BMath General program. It cannot be counted for credit toward a BMath Honours or four-year General degree.
MATH 111B W,S 3C,1T 0.5
Linear Algebra and Solid Geometry
Determinants, vectors, matrices, elementary solid geometry, systems of linear equations.
Prereq: Grade 12 Mathematics or equivalent. Grade 13 or OAC Algebra is recommended but not required. MATH 111A is not a prerequisite for MATH 111B.
Antireq: MATH 114, 134B, 136, 144B, 148
This course is designed for students in the Faculties of Arts and Science and students in the three-year BMath General program. It cannot be counted for credit toward a BMath Honours or four-year General degree.

MATH 113A F 3C,2T 0.5
Calculus 1
The derivative, differentiation, higher order derivatives, implicit functions, differentials, applications of the derivative. The definite integral. Differentiation and integration of the logarithmic, exponential and trigonometric functions.
Prereq: Grade 13 or OAC Calculus
Antireq: MATH 106, 115A, 116, 130A, 137, 140A, 147
This course is designed for students in the Faculties of Arts and Science and students in the three-year BMath General program. It cannot be counted for credit toward a BMath Honours or four-year General degree.

MATH 113B W 3C,2T 0.5
Calculus 2
Prereq: MATH 113A or equivalent
This course is designed for students in the Faculties of Arts and Science and students in the three-year BMath General program. It cannot be counted for credit toward a BMath Honours or four-year General degree.

MATH 114 F 3C,2T 0.5
Algebra and Vector Geometry (For Engineering Students)
Prereq: Grade 13 or OAC Algebra
Antireq: MATH 111B, 134B, 136, 144B, 140
Not open to students in the Faculty of Mathematics.

MATH 115A F 3C,2T 0.5
Calculus 1 (For Co-op Physics and Chemistry Students)
Real numbers, functions, trig functions. Limits. The derivative, differentiation, higher order derivatives, implicit functions, differentials, applications of the derivative. The definite integral. Antidifferentiation. Logarithms and exponential functions, hyperbolic and inverse hyperbolic functions.
Prereq: Grade 13 or OAC Calculus
Antireq: MATH 106, 113A, 116, 130A, 137, 140A, 147
Not open to students in the Faculty of Mathematics.

MATH 115B W,S 3C,2T 0.5
Calculus 2 (For Co-op Physics and Chemistry Students)
Prereq: MATH 115A
Antireq: MATH 113B, 118, 130B, 138, 140B, 148
Not open to students in the Faculty of Mathematics.

MATH 116 F 3C,2L 0.5
Calculus 1 (For Engineering Students)
Review of limits and sequences, and inverse functions; the definite integral; techniques and applications of integration.
Prereq: Grade 13 or OAC Calculus
Antireq: MATH 106, 113A, 115A, 130A, 137, 140A, 147
Formerly MATH 110A
Not open to students in the Faculty of Mathematics.

MATH 117 W,S 3C,2L 0.5
Calculus 2 (For Engineering Students)
Sequences and series of numbers, and convergence; approximation; and the mean value theorem; power series and applications of power series; functions of two variables and properties of surfaces in space.
Prereq: MATH 116 or equivalent
Formerly MATH 110B
Not open to students in the Faculty of Mathematics.

MATH 118 F W 3C,1T 0.5
Algebra
A study of the basic algebraic systems of mathematics: the integers, the integers modulo n, the rational numbers, the real numbers, the complex numbers and polynomials.
Prereq: OAC Algebra or equivalent
Antireq: MATH 111A, 134A, 144A, 145
MATH 135 is also offered at St. Jerome's College in the Fall term.

MATH 136 F,W,S 3C,1T 0.5
Linear Algebra 1
Prereq: OAC Algebra or equivalent
MATH 135 is recommended but not required.
Antireq: MATH 111B, 114, 134B, 144B, 148
MATH 136 is also offered at St. Jerome's College in the Winter term.

MATH 137 F,W,S 3C,1T 0.5
Calculus 1
Review of limits, continuity and inverse functions. Riemann sums and the definite integral. The fundamental theorem, techniques of integration and applications of integration.
Prereq: OAC Calculus or equivalent
MATH 137 is also offered at St. Jerome's College in the Fall term.

MATH 138 F,W,S 3C,1T 0.5
Calculus 2
Prereq: MATH 137
Antireq: MATH 113B, 115B, 118, 130B, 140B, 148
MATH 138 is also offered at St. Jerome's College in the Winter term.

MATH 145 F 3C 0.5
Algebra
MATH 145 is an advanced-level, enriched version of MATH 135.
Prereq: OAC Algebra (or equivalent) and an OAC math average of at least 85%, or consent of instructor
Antireq: MATH 111A, 134A, 135, 144A
MATH 146 W.S 3C 0.5
Linear Algebra 1
MATH 146 is an advanced-level, enriched version of MATH 136.
Prereq: MATH 145 or consent of instructor
Antireq: MATH 111F, 114, 134B, 136, 144B

MATH 147 F 3C 0.5
Calculus 1
MATH 147 is an advanced-level, enriched version of MATH 137.
Prereq: OAC Calculus (or equivalent) and an OAC math average of at least 85%, or consent of instructor
Antireq: MATH 106, 113A, 115A, 116, 130A, 137, 140A

MATH 148 W.S 3C 0.5
Calculus 2
MATH 148 is an advanced-level, enriched version of MATH 138.
Prereq: MATH 147 or consent of instructor

MATH 210 F,W 3C 0.5
Advanced Calculus (For Chemical Engineers)
Partial differentiation, the gradient, multiple integrals with applications, line and surface integrals, divergence and curl, theorems of Green and Stokes.
Applications to physical problems.
Prereq: MATH 118
Antireq: AM 231, MATH 212, 213B, 220B, 230B, 240B
Not open to students in the Faculty of Mathematics.

MATH 211 F,W 3C,1T 0.5
Advanced Calculus 1 (For Electrical Engineers)
Fourier series; Ordinary differential equations; Laplace transform; applications to linear electrical systems.
Prereq: MATH 118
Cross-listed as E&CE 205
Not open to students in the Faculty of Mathematics.

MATH 212 F,S 3C,1T 0.5
Advanced Calculus 2 (For Electrical Engineers)
Prereq: MATH 211
Antireq: AM 231, MATH 210, 213B, 220B, 230B, 240B
Cross-listed as E&CE 206
Not open to students in the Faculty of Mathematics.

MATH 213A F 3C 0.5
Calculus 3 (For Science Students)
Infinite series. Partial derivatives, chain rule, total differential, Taylor's theorem, extreme values.
Prereq: MATH 113B or 115B
Coreq: MATH 111B
Not open to students in the Faculty of Mathematics.

MATH 213B W,S 3C 0.5
Calculus 4 (For Science Students)
Prereq: MATH 213A or equivalent
Antireq: AM 231, MATH 210, 212, 220B, 230B, 240B
Not open to students in the Faculty of Mathematics.

MATH 215 F,W 3C 0.5
Differential Equations (For Chemistry Students)
Prereq: MATH 113B or 115B, or equivalent
Antireq: AM 250, MATH 216
Not open to students in the Faculty of Mathematics.

MATH 216 F,S 3C 0.5
Differential Equations (For Physics or Chemical Engineering Students)
Prereq: One of MATH 113B, 115B, 118, or equivalent
Antireq: AM 250, MATH 215
Not open to students in the Faculty of Mathematics.

MATH 225 F 3C 0.5
Linear Algebra 2
Linear transformations, eigenvalues and eigenvectors. Applications selected from computer graphics, cryptography, differential equations, quadratic forms, conic sections.
Prereq: MATH 111B or equivalent
Antireq: MATH 224A, 234A, 235, 244A, 245
Not open to Honours Mathematics students.
This course replaced MATH 224A effective Fall, 1990.

MATH 227 F 3C,1T 0.5
Calculus 3
Calculus of functions of several variables. Limits, continuity, differentiability, the chain rule. Taylor's formula. Optimization problems, mappings, the Jacobian. Multiple integrals.
Prereq: MATH 113B or equivalent
Coreq: MATH 111B or equivalent
Not open to Honours Mathematics students.
This course replaced MATH 220A effective Fall, 1990.

MATH 235 F,W,S 3C 0.5
Linear Algebra 2
Linear transformations, eigenvalues and eigenvectors. Applications selected from computer graphics, cryptography, differential equations, quadratic forms, conic sections.
Prereq: MATH 136
Antireq: MATH 224A, 225, 234A, 244A, 245
This course replaced MATH 234A in the Faculty core effective Fall, 1990.
MATH 235 is also offered at St. Jerome's College in the Fall and Winter terms.
MATH 237 F,W,S 3C,1T 0.5
Calculus 3
Calculus of functions of several variables. Limits, continuity, differentiability, the chain rule, Taylor's formula. Optimization problems, mappings, the Jacobian. Multiple integrals.
Prereq: MATH 138
Coreq: MATH 136
This course replaced MATH 230A in the Faculty core effective Fall, 1990. MATH 237 is also offered at St. Jerome's College in the Fall and Winter terms.

MATH 245 F,W 3C 0.5
Linear Algebra 2
MATH 245 is an advanced-level, enriched version of MATH 235.
Prereq: MATH 146 or consent of instructor
Antireq: MATH 224A, 225, 234A, 235, 244A
This course replaced MATH 244A effective Fall, 1990.

MATH 247 F,W 3C 0.5
Calculus 3
MATH 247 is an advanced-level, enriched version of MATH 237.
Prereq: MATH 148 or consent of instructor
Coreq: MATH 136 or 146
This course replaced MATH 240A effective Fall, 1990.

MATH 322B W 3C 0.5
Introduction to Complex Variable Theory
Complex numbers; continuity, differentiability, analyticity of functions; the Cauchy-Riemann equations; solution of Laplace's equation; conformal mapping by elementary functions, and applications; the Cauchy and allied theorems; Taylor and Laurent expansions, uniform convergence and power series; the residue calculus, and applications. The emphasis will be on applications.
Prereq: MATH 220B
Antireq: AM/PMATH 332, MATH 332B, PMATH 352
Not open to Honours Mathematics students.
This course will not be offered on campus after Winter, 1992.

MATH 324 F 3C 0.5
Abstract Algebra 2
Topics in abstract algebra: groups, rings, fields and applications.
Prereq: MATH 224B
Antireq: PMATH 334, 344
Not open to Honours Mathematics students.
This course will not be offered on campus after Fall, 1991.

COURSES NOT OFFERED 1991-92
MATH 220B Advanced Calculus 2
MATH 224B Abstract Algebra 1
MATH 226A Elementary Differential Equations 1
MATH 226B Elementary Differential Equations 2

Mathematics Electives

Undergraduate Office
MC 5115, ext. 3905

Introductory Note
MTHEL courses are not restricted to students in the Faculty of Mathematics. When taken by Mathematics students, MTHEL courses count as non-mathematics courses.

MTHEL 100 F,W,S 2C 0.5
Commercial and Business Law for Mathematics Students

MTHEL 102 W 3C 0.5
Uses and Abuses of Statistics
This course provides an appreciation of how to correctly use statistical arguments in a wide variety of applications. Topics include descriptive statistics, sample surveys, experimental design, index numbers, regression models.

MTHEL 206A F,S 2C 0.5
Introduction to Mathematics Education
Current trends in education, professional practice and administration, the role of the department head, lesson planning, techniques of teaching, evaluation of students, special students, extracurricular activities, the relationship between elementary and secondary school mathematics, audio-visual materials.
Prereq: Consent of instructor.
This course is normally open only to students in the Co-op Math/Teaching Option.

MTHEL 205A F,W 3C 0.5
General Life Insurance 1
Types of Life Insurance contracts and their uses, basis of risk measurements, modified valuation methods, non-forfeiture values, dividend formulae, selection of risks, substandard risks, and principles of reinsurance.
Course Descriptions
Mathematics Electives
Mechanical Engineering

MTHEL 305B W,S 3C 0.5
General Life Insurance 2
Legal aspects of life insurance, settlement options, principles of group and industrial insurance, organization and structure of life insurance companies, financial statements, the mathematics underlying insurance taxation.
Prereq: MTHEL 305A

Mechanical Engineering

Undergraduate Officer
A.B. Strong, E2-2330, ext. 3625

Introductory Notes

1. All courses extend over 1 term only, and consist of 3 hours of lectures per week unless otherwise specified.

2. In general, the only prerequisites are the core courses, unless otherwise specified.

M.E 166 W,S 2C 3L 0.5
Engineering Concepts 2
A continuation of GEN E 163 with applications of graphics, measurement and other analytic principles applied to introductory problems in the various disciplines of Mechanical engineering; an introduction to engineering design methods as applied to Mechanical Engineering and including specification development, information-gathering, concept formulation, feasibility analysis and report writing.
Prereq: GEN E 163

M.E 202 F W 3C 1T 0.5
Statistics for Engineers
Equivalent to M SCI 251

M.E 203 F,S 3C,1T,1L 0.5
Ordinary Differential Equations

M.E 212 F,W 3C 1T 0.5
Dynamics

M.E 215 F,S 3C,3L 0.5
Structure and Properties of Materials

M.E 219 F,W 3C,1T 0.5
Mechanics of Deformable Solids 1
Concept of equilibrium, force analysis of structures and structural components, equilibrium of deformable bodies, stress and strain concepts, stress-strain relationships, stress analysis of prismatic members in axial, shearing, torsional and flexural deformations, shear force and bending moment diagrams.

M.E 220 F,S 3C,1T 0.5
Mechanics of Deformable Solids 2
A general treatment of the behaviour of structural components from the study of stress and strain in solids. Topics include super-position, energy theorems, theories of failure, elastic and inelastic analysis of symmetrical bending, torsion of circular members, columns and stability, and virtual work.

M.E 250 F,S 3C,1T,1L 0.5
Thermodynamics 1

M.E 282 F,S 3C,1T,3L
Introduction to Microprocessors and Digital Logic
Number systems, codes and coding, minimization techniques applied to design of logic systems. Component specifications. Discussion of microprocessors, memory and I/O logic elements. Microcomputer structure and operation. I/O modes and interfacing. Machine language and assembler programming. Design and application of digital systems for data collection and control of pneumatic hydraulic and machine systems. Laboratory work includes the use of microcomputers.

M.E 300A/300B W,S,F,W 2C 0.0
Seminar
Technical specialties in Mechanical Engineering, discussion of options, curriculum, seminars and technical topics in the various options.

M.E 304 W,S 3C,1T,2L 0.5
Numerical Analysis
A survey of numerical procedures with emphasis upon computer implementation. In particular, the following topics are covered: interpolation, curve fitting, solution of non-linear equations, numerical integration, numerical solution of ordinary differential equations, matrix algebra and solution of systems of linear equations, and problems in the solution of partial differential equations.

M.E 305 W,S 3C,1T 0.5
Partial Differential Equations
Modelling physical systems with distributed parameters. Boundary and initial conditions. Division into hyperbolic, parabolic and elliptic equations by means of discriminant.
**Course Descriptions**

**Mechanical Engineering**

**M E 321 W,S 3C,3L,1T** 0.5
**Kinematics and Dynamics of Machines**

**M E 322 F,W 3C,1T,2L** 0.5
**Mechanic Design**
Analysis and synthesis of machine elements. Factors affecting working stresses, fatigue, creep and impact considerations. Design of shafting, springs, screws, clutches, brakes and gears.

**M E 330 W,S 3C,2L** 0.5
**Control of Properties of Materials**
Phase equilibria, non-equilibrium behaviour, heat treatment of metals, diffusion, strengthening processes, Alloying, composite materials, cold and hot working. Failure of engineering materials; creep, fatigue, corrosion and other environmental degradation processes. Prevention of service failures.

**M E 340 F,W 3C,3L,1T** 0.5
**Manufacturing Processes**
The principles of manufacturing unit processes including casting, forming, machining and joining. Interactions between design, materials (metals, polymers, ceramics) and processes. Advantages and limitations, relative cost, and production rates of competitive processes.

**M E 351 W,S 3C,1T,3L** 0.5
**Fluid Mechanics 1**
Physical properties of fluids and fundamental concepts in fluid mechanics. Hydrostatics. Conservation laws for mass, momentum and energy. Flow similarity and dimensional analysis as applied to engineering problems in fluid mechanics. Laminar and turbulent flow. Engineering applications such as flow measurement, flow in pipes and fluid forces on moving bodies. Introduction to compressible flow.

**M E 353 F,W 3C,3L,1T** 0.5
**Heat Transfer 1**
Introduction to heat transfer mechanisms. The formulation and solution of steady and transient heat conduction. Radiant heat transfer including exchange laws and view factors. Introductory convective heat transfer.

**M E 354 W,S 3C,1T** 0.5
**Thermodynamics 2**
Emphasis on applications of thermodynamics to flow processes, real fluids, evaluation of state functions of real fluids. Non-reacting mixtures, reacting mixtures, equilibrium considerations.

**M E 360 F,W 3C,3L,1T** 0.5
**Introduction to Control Systems**

**M E 362 F,W 3C,3L,1T** 0.5
**Fluid Mechanics 2**
Basic equations of two-dimensional flow, potential flow, exact viscous solutions, introduction to lubrication, boundary layers, and introduction to turbulence. Turbomachinery fundamentals and applications. Selected advanced topics.

**M E 400A/400B S,F,W 2C** 0.0
**Seminar**
Research frontiers in Mechanical Engineering, specific discussion of research done at Waterloo by members of research groups.

**M E 401 F,W 3C** 0.5
**Law for the Professional Engineer**
The Canadian Legal System, Forms of Business Organizations, Tort Law, the role of the professional; Contract Law, the Elements of a Contract, Statute of Frauds, Misrepresentation, Duress and Undue Influence, Mistake, Contract Interpretation, Discharge of Contract; Breach of Contract and fundamental breach; Agreements between the client and Engineer; General Law, the Mechanics' Lien Act, comparative discussion of the Professional Engineers Act as it relates to the earlier statute, Intellectual Property and Industrial Property.

It is intended to prepare the student for the examination in law which must be written by the Engineer for the Association of Professional Engineers of the Province of Ontario. This course is restricted to senior Mechanical Engineering students.

**M E 423 F,S 3C,1T** 0.5
**Mechanical Design 2**
A continuation of the M E 322 course in analysis and synthesis of machinery, including advanced analysis of machine elements such as clutches, brakes, couplings, journal bearings and gears. Advanced machine design concepts such as reliability, optimization and techniques for stimulating innovative design. A synthesis project involving the machine elements studied is usually included.

**M E 432 W 3C,1L** 0.5
**Physical Metallurgy of Deformation and Fracture**
Microscopic origins of elastic and inelastic behaviour. Plastic flow at low and high temperatures with emphasis on the microscopic mechanisms and their application to engineering design. Deformation mechanism maps. Types of fracture and micromechanism fracture maps. Application of fracture mechanics. Fatigue and cyclic hardening behaviour. Environmental effects.

**M E 435 F,S 3C,1L** 0.5
**Industrial Metallurgy**
This course is intended for those students interested in acquiring a working knowledge of metallurgy. It will cover: Metals and alloy systems, iron-carbon alloys, heat treatment and the function of alloying elements in steel, corrosion and scale resistant alloys, copper and nickel base alloys, light metals and their alloys; casting, hot and cold working of metals; soldering, brazing and welding; corrosion and oxidation; metal failure analysis.

**M E 447 F,S 3C,2L** 0.5
**Advanced Manufacturing Technologies**
M E 448 W 3C 0.5
Production Engineering and Design of Manufacturing Systems

M E 452 W 3C 0.5
Energy Transfer in Buildings
Thermodynamic properties of moist air; psychrometric charts; humidity measurements; direct water contact processes; heating and cooling of moist air by extended surface coils; solar radiation; heating and cooling loads on buildings; effects of the thermal environment; air conditioning and calculations.

M E 456 F.S 3C,1L 0.5
Heat Transfer 2
Selected topics in heat transfer fundamentals and applications. Topics to be covered include the fundamentals of convection with analytical solutions to simple laminar flow problems and approximate solutions to turbulent flow problems based on analogies between momentum and heat transfer. Also covered is radiant exchange in grey enclosures and in black enclosures containing emitting-absorbing gases. The remaining topics will be chosen from design of heat exchangers; condensation heat transfer; boiling heat transfer; and the treatment of problems in heat conduction.

M E 459 F.S 3C 0.5
Energy Conversion
Review of reserves and consumption trends of Canada's and the world's energy resources. Design of fossil-fuel central power plants, including boiler efficiency calculations and advanced steam and binary cycles. Review of atomic physics including fission and fusion energy. Design of nuclear fission power plants including design of reactor core for critical conditions, fuel cycles and radiation hazards. Design considerations for solar energy conversion devices including: availability of solar energy, solar-thermal converters, thermal storage and photovoltaics. Principles of fuel cells and some aspects of their design. Other topics as appropriate.

M E 463 F.W 3C 0.5
Tribology 1
The science of friction, lubrication and wear. The topography and contact mechanics of real surfaces. The measurement of friction and wear. Friction and wear theories for elastic and plastic contact. Lubrication mechanisms; hydrostatic, hydrodynamic, elastohydrodynamic, boundary, extreme pressure, and solid film. Physical and chemical properties of lubricants. Bearings and their selection.

M E 469 F.S 3C 0.5
Dynamics of the Atmospheric Boundary Layer
For those students interested in working on engineering problems that involve the flow of air in the lower kilometre of the atmosphere. Topics to be studied include: composition of the atmosphere, surface wind variation, vertical variation of temperature, pressure, and moisture, basic moisture thermodynamics, fluid mechanics on rotating earth, physics of atmospheric turbulence, atmospheric stability, vertical variation of wind, inversion layer dynamics, introduction to atmospheric diffusion processes.

M E 482 F.W,S 9L 0.5
Mechanical Engineering Projects
Engineering assignments requiring the student to demonstrate initiative and assume responsibility. Student activity is guided and co-ordinated by a faculty supervisor. In selecting projects, particular account is taken of the student's field of specialization. Projects, in general, involve technical disciplines beyond the strictly mechanical engineering field.

M E 502 W 3C 0.5
Patenting for Engineers
An overview of intellectual property: copyright, industrial design, trade marks, trade names, and trade secrets. Ownership of intellectual property, Invention optimization. Patenting: history, legal context, infringement, searching, writing and understanding patent claims, preparing patent drawings, patent application preparation, submitting the application to the Canadian or United States patent offices, dealing with the examiner, foreign patents. Selling and licencing technology. Litigation.

M E 524 W 3C,1T 0.5
Advanced Dynamics
This course is a continuation of M E 212 and M E 321. Basic kinematic and dynamic concepts are extended. The emphasis is on vector methods, general kinematic relationships, planar and three-dimensional motion, gyroscopic effects, variational mechanics, Lagrange's equation and Hamilton's equations. Computer simulation of non-linear systems is discussed and a project involving computer simulation is usually assigned.

M E 525 F.S 3C 0.5
Mechanical Vibrations in Machines
Fundamentals of mechanical vibration, transient and forced vibrations, vibration of mechanical systems with one-, two- and multi-degrees of freedom, vibration measurement and isolation, continuous system, modal analysis.

M E 527 W 3C 0.5
Mechanics of Deformable Solids 3

M E 531 W 3C 0.5
Physical Metallurgy of Structures and Transformations

M E 533 W 3C,1L 0.5
Composite Materials
Fibres, particulates and matrices. Consideration of the interface between the matrix and the fibre or particulate. Geometrical arrangements of fibres within laminae and their influences on elastic and strength properties. Strength of laminates and short fibre composite materials. Consideration when designing with composite materials. Fatigue, notch sensitivity and environmental deterioration.

M E 534 F.S 3C,1L 0.5
Non-metallic Materials


The principles of static and continuous casting processes including sand, investment, die and various continuous casting techniques. Review of heat transfer, fluid flow and solidification theory as it applies to casting. Gating, runner, sprue and riser design in static castings. Origin of various casting defects including hot tears, distortion, solidification shrinkage and residual stresses.

Features and advantages of the various welding processes. Welding arc characteristics. Temperature distributions around welds. Metallurgy of the weld metal and heat affected zone in various alloys, including carbon and stainless steels, and aluminum alloys. Origin of various weld defects and methods of detecting them. Static and dynamic design of welded joints. Residual stresses, distortion and fracture of welds.


Combustion thermodynamics; Introduction to chemical kinetics of combustion; Combustion properties of fuels; Flammability of combustible mixtures. Flame propagation mechanisms, pre-mixed and diffusion; Stability of flames; Introduction to combustion aerodynamics, jet flames: Atomization; Droplet and spray combustion; Elementary ignition concepts and theory. Basic detonation theory.

A course presenting the fundamental ideas involved in conventional finite element analysis in Mechanical Engineering. Domain discretization, interpolation and shape functions, element derivation and types, element stiffness or property equations, assembly procedure, boundary conditions, solution methods for the algebraic equation system, applications in heat transfer, fluid flow, and stress analysis. Student will, throughout the course, write and test their own finite element code through individual subroutine construction as the course progresses.


Course Descriptions
Middle East Studies —
Music

MES 350A S 1.0
Religion and Culture in the Middle East
A travel seminar to Egypt (including the Sinai) and Greece to study religious dimensions expressed in the culture, community and social life in these countries with a main emphasis on the Muslim and the variety of Christian traditions.
Prereq: A minimum second-year standing, or consent of the Instructor. Students should fill an application form with the Director before registering for this course.

Fine and Performing Arts
The University offers courses in:

Dance see page 16:42
Drama and Theatre Arts see page 16:44
Fine Arts see page 16:67
Music see page 16:103

For program information please see Chapter 8, Faculty of Applied Health Sciences, and Chapter 9, Faculty of Arts

Music
Undergraduate Officer
K. Hull, Conrad Grebel College, Room 153, 885-0220, ext. 44

Courses not offered in the current academic year are listed at the end of this section.

Introductory Note
Students should consult their faculty advisor regarding how term courses with credit weights other than 0.5 are counted for degree credit in their program.

MUSIC 100 S,F,W,S 3C 0.5
Introduction to Music
The techniques, terminology, forms and styles of Western music through lectures and listening, as exemplified by great works from all eras of music history.
Neither MUSIC 150 nor MUSIC 151 may be taken for credit if MUSIC 100 is taken for credit. However, MUSIC 150 and MUSIC 151 together may serve in lieu of MUSIC 100 as prerequisite for upper-level Music courses.

MUSIC 101 S,F,W,S 2L 0.25
Music Ensemble
See MUSIC 100 for course description.

MUSIC 111 S,F,W,S 3C,1L 0.5
Fundamentals of Music Theory
An introduction to the primary skills of music practice emphasizing the reading and writing of musical notation. Students will learn elementary keyboard, listening, and sight-singing skills. For students with minimal musical background. Does not fulfill music major or minor requirements.
Course Descriptions
Music

MUSIC 125 F 3C 0.5
Popular Music and Culture
An examination of the styles, forms and development of twentieth-century popular music. The social, commercial and technological aspects of popular music are considered.

MUSIC 200 W 3C 0.5
The Symphony
A survey of the great symphonies from Haydn to Stravinsky, through lectures and listening. A portion of the course will be devoted to works being performed by the Kitchener-Waterloo Symphony Orchestra during the term.
Prereq: None, but MUSIC 100 is recommended. The ability to read music notation is not required.

MUSIC 201 S,F,W,S 2L 0.25
Music Ensemble
See MUSIC 101 for course description.

MUSIC 202 S,F,W,S 2L 0.25
Music Ensemble
See MUSIC 101 for course description.

MUSIC 221 W 3C 0.5
Women and Music
A study of the role of women in music from antiquity to the present, emphasizing both "classical" and "popular" music within social, cultural settings of Western and Third World countries.

MUSIC 221 F 3C 0.5
Psychology of Music
The study of music from a behavioural science perspective. Topics include auditory and musical perception, music cognition, musical aptitudes and abilities, learning and pedagogy, creativity and aesthetic experience, emotive human responses, and the social psychology of musical activities.
Prereq: MUSIC 100 and PSYCH 101 or consent of instructor

MUSIC 250 S,F,W,S 3C,1L 0.5
Music Theory 1
The study of basic melodic, harmonic and voice leading concepts including an introduction to figured bass and functional harmony. Ear training, sight-singing and keyboard lab sessions will be integrated with written and analytical work.
Prereq: A basic knowledge of scales, triads, and music notation or MUSIC 111

MUSIC 251 W 3C,1L 0.5
Music Theory 2
The study of harmony, counterpoint and form of 18th and early 19th century music. Sight-singing, ear training and keyboard lab sessions will be integrated with written and analytical work.
Prereq: MUSIC 250 or consent of instructor

MUSIC 253 F 3C 0.5
Medieval and Renaissance Music
The study of music that flourished under courtly and church patronage from the early Christian Church to 1600. Gregorian chant, liturgical drama, mass, motet, secular songs and instrumental music are studied.
Prereq: MUSIC 100 or consent of instructor

MUSIC 254 W 3C 0.5
Baroque and Classical Music
The study of music of the Baroque and Classical eras from 1600 to 1800. A survey of major genres by Monteverdi, Schütz, Purcell, Bach, Handel, Haydn, Mozart and others.
Prereq: MUSIC 100 or consent of instructor

MUSIC 264 W 3C 0.5
The Art Song
A study of the music written for solo voice from 17th century to present.
Prereq: MUSIC 100 or consent of instructor

MUSIC 266 S,F,W,S std 0.5
Music Studio
Individual instruction in Voice, Piano, Organ, Classical Guitar and orchestral instruments. This course is available only to Music majors and minors.
Prereq: Royal Conservatory Grade VIII level and audition with Music Faculty
Studio Fee

MUSIC 267 S,F,W,S std 0.5
Music Studio
See MUSIC 266 for course description.
Prereq: MUSIC 266 and consent of Music Faculty
Studio Fee.

MUSIC 272 S 3C 0.5
Traditional Folk Music of Canada
A study of the traditional folk music of Canada of both native and immigrant peoples, including traditional instruments, collectors, the ballad of Canada, chansons de Quebec, the songs commemorating the great events of Canada's history, and songs of work and pleasure.
Offered S 1992

MUSIC 273 S 3C 0.5
Traditional Folk Music
A delineation of the characteristic motifs in folk music as found in Great Britain, Canada, the United States and Australia. Various folk instruments will be introduced.
Offered S 1991

MUSIC 274 W 3C 0.5
Introduction to Jazz
A survey of the development of jazz music in the United States and Canada, with emphasis on the development of jazz schools and individual styles as well as a study of melodic, harmonic, and rhythmic improvisation. Styles will be demonstrated through recordings and live performance.

MUSIC 275 F 3C 0.5
Computer Applications in Music
A comprehensive survey of computer applications in the creation, production and study of music.
Prereq: MUSIC 100 or consent of instructor
Previous programming experience is recommended but not essential

MUSIC 301 S,F,W,S 2L 0.25
Music Ensemble
See MUSIC 101 for course description.

MUSIC 360 F 3C 0.5
Music and Culture in Vienna
A Spring seminar to be taught in Vienna and environs. The course includes daily lectures and attendance of music performances during the Vienna Music Festival, as well as tours of places relating to the culture of Vienna.
Prereq: MUSIC 100 or consent of instructor
Offered Spring 1992

MUSIC 380 F 3C 0.5
Music of the Church
A study of the music and the philosophies of music of the Christian church from the beginning to the present. Singing and/or listening to the music will be an integral part of the course.
Prereq: MUSIC 100 or consent of instructor

MUSIC 395A/395B 0.5/0.5
Music and Culture in Vienna
A Spring seminar to be taught in Vienna and environs. The course includes daily lectures and attendance of music performances during the Vienna Music Festival, as well as tours of places relating to the culture of Vienna.
Prereq: MUSIC 100 or consent of instructor
Offered Spring 1992

MUSIC 396 F 3C 0.5
Music of the Church
A study of the music and the philosophies of music of the Christian church from the beginning to the present. Singing and/or listening to the music will be an integral part of the course.
Prereq: MUSIC 100 or consent of instructor

MUSIC 396 S,F,W,S std 0.5
Music Studio
See MUSIC 266 for course description.
Prereq: MUSIC 267 and consent of Music Faculty
Studio Fee.
MUSIC 367  S,F,W,S std 0.5
Music Studio
See MUSIC 266 for course description.
Prereq: MUSIC 366 and consent of Music Faculty
Studio Fee.

MUSIC 370 F 3C,1L 0.5
Music Theory 3 (19th Century)
The study of chromatic harmony as well as melodic and formal aspects of 19th century music. Ear training, sight-singing and keyboard lab sessions will be integrated with written and analytical work.
Prereq: MUSIC 251 or consent of instructor

MUSIC 371 W 3C,1L 0.5
Music Theory 4 (20th Century)
A study of the compositional aspects of 20th-century music, including extended tonality, atonality, 12-tone writing, neoclassical idioms and contemporary compositional procedures. Lab sessions will cover non-tonal melodic reading and complex chord structures.
Prereq: MUSIC 370 or consent of instructor

MUSIC 374 F 3C 0.5
Composition Seminar
Creative and critical potential is developed through supervised practice, tutorials and seminars. Free composition, style emulation, arranging and orchestration will be dealt with.
Prereq: MUSCI 251 or consent of instructor

MUSIC 375 W 3C 0.5
Electroacoustic Music and MIDI Applications
The study of electroacoustic music and MIDI applications in sequencing and programming with synthesizers and computers. Composition, analysis and history of electroacoustical music, as well as practical studies experience, are included.
Prereq: MUSIC 251 or consent of instructor

MUSIC 380 F,W 0.5
Directed Study in Music
Prereq: Advanced standing in music and consent of instructor

MUSIC 381 F,W 0.5
Directed Study in Music
Prereq: Advanced standing in music and consent of instructor

MUSIC 390 F,W 3C 0.5
Special Topics in Music 1
Study of a limited field under tutorial guidance.
Prereq: MUSIC 100 and consent of instructor

MUSIC 391 F,W 3C 0.5
Special Topics in Music 2
Study of a limited field under tutorial guidance.
Prereq: MUSIC 100 and consent of instructor

MUSIC 466 F,W std 0.5
Music Studio
See MUSIC 266 for course description.
Prereq: MUSIC 367 and consent of Music Faculty
Studio Fee

MUSIC 467 F,W std 0.5
Music Studio
A continuation of Music Studio. A recital is required.
Prereq: MUSIC 466 and consent of Music Faculty
Studio Fee

MUSIC 490A/B S,F,W,S 0.5/0.5
Senior Honours Seminar
A research seminar required of all honours students. The topics will vary from year to year depending on the interests of the students and instructor(s).

COURSES NOT OFFERED 1991-92
MUSIC 150 Survey of Music History 1
MUSIC 151 Survey of Music History 2
MUSIC 241 Principles of Music
Therapy
MUSIC 265 Piano Literature
MUSIC 260 Canadian Music
MUSIC 332 Musical Aesthetics and Criticism
MUSIC 353 Music of the Romantic Period (19th Century)
MUSIC 354 Music of the Twentieth Century
MUSIC 372 Choral Music, Repertoire and Techniques 1
MUSIC 373 Choral Music, Repertoire and Techniques 2

OPTOM 100 F 2C 0.5
History and Orientation
A brief history of the profession and the development of visual science; a consideration of legal and organizational development of optometry; the role of professional associations. The role and scope of optometry and its relationship to other professions and the community.

OPTOM 104 F 3C,3L 0.5
Anatomy of the Eye 1
The gross, microscopic and ultrastructure of ocular tissues. The embryology and comparative anatomy of the eye will be emphasized. The relationship of the eye to the vascular supply of the head and the nervous system will be studied. This course is credited only upon completion of OPTOM 114.

OPTOM 105 F 3C,1T 0.5
General Pathology 1
Basic disease processes, including inflammation, degeneration, neoplasia; pathogenic microbiology and related diseases; immunity and hypersensitivity; disease caused by physical agents; diseases of the organ systems.

OPTOM 106 F 3C,3L,1T 0.5
Geometrical Optics
Prereq: PHYS 121/121L, 122/122L, MATH 113A/B

OPTOM 109 F 3C,3T 0.5
Visual Perception 1: Perception of Light
Principles of radiometry and photometry; illumination and related factors involved in the design and control of the visual environment in relationship to the human visual system; lighting survey techniques.
Course Descriptions

Optometry

OPTOM 111 W 3C,3L 0.5
Fundamentals of Visual Optics
Prereq: OPTOM 106

OPTOM 114 W 3C,2L 0.5
Anatomy of the Eye
A continuation of OPTOM 104
Prereq: OPTOM 104

OPTOM 115 W 4C,1T 0.5
General Pathology
A continuation of 105.
Prereq: OPTOM 105

OPTOM 149 W 3C 0.5
Public Health Optometry
Introduction to the foundation and basic sciences of public health optometry with an emphasis on the epidemiology of vision problems.

OPTOM 241 F 3C,3L 0.5
Physiological Optics
Ocular motility; kinematics of eye movements, muscle actions, measurements of eye movements, types of eye movements, innervational systems subserving eye movements, clinical application.
Prereq: OPTOM 111

OPTOM 242 F 3C,3L 0.5
Clinical Optometry
Lectures and laboratories on clinical techniques for examination of the optical properties of the eye.
Prereq: OPTOM 111

OPTOM 244 W 3C,2L 0.5
Neurophysiology of Vision
The neural processing of colour, brightness, movement and form by the retina, lateral geniculate, cortex, superior colliculus and other brain centres. Neural mechanisms underlying binocular depth perception, the accommodative response and eye movement.
Prereq: OPTOM 104/114

OPTOM 245 F 3C 0.5
Ocular Pathology
Signs, symptoms, clinical detection and management of primary and secondary ocular disease, and emergencies; primary health care responsibilities.
Prereq: OPTOM 105/115

OPTOM 246 F 3C,4L 0.5
Ophthalmic Optics 2
Prereq: OPTOM 106/116

OPTOM 251 W 3C,3L 0.5
Physiological Optics
Prereq: OPTOM 241

OPTOM 252 W 3C,3L 0.5
Clinical Optometry
Clinical techniques for the examination of the binocular relations of the nonstrabismic patient, with particular emphasis on the study of the relationship between accommodation and convergence. Techniques of phorometry, prism vergence tests, relative accommodation tests, retinoscopy, and monocular and binocular cross cylinder tests.
Prereq: OPTOM 241/242

OPTOM 254 F 2C,2L 0.5
Physiology of The Eye and Ocular Adnexa
The physiology of the smooth muscles of the eye, the extracocular striate muscles, the lacrimal apparatus, the cornea, the iris, the lens, the ciliary body and the vitreous body. Production and drainage of aqueous and related influences on intraocular pressure. The vascular supply of the eye.
Prereq: OPTOM 104

OPTOM 255 W 3C,2L 0.5
Ocular Pathology
A continuation of 245
Prereq: OPTOM 245

OPTOM 261 F 3C,3L 0.5
Physiological Optics

OPTOM 274 W 2C 0.5
Genetics for Optometrists
A brief review of Mendelian genetics, and the molecular basis of modern genetics; methods of chromosomal and gene product analysis including carrier detection. Inherited conditions of particular interest, e.g., colour vision, albinism, aniridia, refractive error, retinoblastoma. Genetic counselling.
Prereq: OPTOM 245

OPTOM 342 F 3C,2L 0.5
Clinical Optometry: Case Analysis
Methods of analysing clinical data emphasizing differential diagnosis, scientific control of psycho-physical measurements, prognosis, recommended therapies, and the clinical applications of the visual sciences.
Prereq: OPTOM 252

OPTOM 344 F 2C 0.5
Sensory Physiology
Peripheral and central nervous system pathways. The skin senses, pain and adaptation to pain, especially as they relate to cornea. The vestibular sense and its influence on eye-movements, muscle sensory organs, including those in extra-ocular muscles, audition, olfaction, taste, visceral sensations and the origin of headaches.

OPTOM 346 F 2C,4L 0.5
Ophthalmic Optics 3
Prereq: OPTOM 116/246

OPTOM 347 F 3C,2L 0.5
Optometric Specialties: Contact Lenses
A series of lectures and laboratories on the principles and procedures of prescribing and fitting contact lenses.

OPTOM 348A/B F,W 8 Clinic 0.5/0.5
Optometry Clinic
Students are assigned to various areas within the clinic where, under direct clinical faculty supervision, they participate in the provision of optometric services to clinic patients. In addition to primary care and optical services, they are exposed to the provision of other optometric services such as contact lens care and ocular health assessment.
Prereq: OPTOM 242, 252
OPTOM 350 W 4C 0.5
Optometrical Jurisprudence and Practice Management

OPTOM 351 W 3C,2L 0.5
Physiological Optics
Prereq: OPTOM 261

OPTOM 352 W 3C,2L 0.5
Clinical Optometry: Strabismus and Orthoptics
Detection and evaluation of sensory and motor characteristics of vision in strabismic and non-strabismic patients. Classifications, diagnoses, prognoses, and modes of therapy for strabismus, amblyopia, and non-strabismic binocular anomalies.
Prereq: OPTOM 242, 252, 342

OPTOM 353 W 2C 0.5
Optometric Communication
A series of lectures and practical assignments designed to improve the student's communication skills when conveying their diagnosis to the patient, school personnel and other health care professionals.

OPTOM 357 W 2C,2L 0.5
Optometric Specialties
A. Low Vision. A series of lectures and labs demonstrating the optometric assessment and management of low vision patients. Optical characteristics of various aids will be included (2/3 term).
B. Aniseikonia. The theory, assessment and treatment of aniseikonia is outlined (1/3 term).
Prereq: OPTOM 342

OPTOM 364 F 4C,1L 0.5
Ocular Pharmacology
Principles of drug action on the eye. Drug absorption, distribution and elimination. Action of drugs on nerve transmission. Action of drugs applied topically to the eye and administered systemically on ocular physiology and vision - including wanted and unwanted effects. Selection and use of products for diagnostic procedures, therapy of ocular diseases, and management of ocular emergencies.
Prereq: OPTOM 245, 255

OPTOM 372 W 2C 0.5
Pediatric Optometry
Consideration of the development of the optical and sensory-motor functions of the visual system provides the basis upon which this course examines the clinical testing and treatment procedures for infants and young children.
Prereq: OPTOM 242, 252

OPTOM 418 S Clinic 0.0
Spring/Summer Practicum
Students will be required to complete a supervised clinical practicum lasting at least eight weeks. This will be arranged by faculty.
Prereq: Successful completion of Year Three

OPTOM 440 F 2C 0.5
Optometric Practice Management
A continuation of the practice management section of OPTOM 350.

OPTOM 441 F 3L 0.5
Optometry Research Project
Students with an interest in research may arrange with a professor to undertake a research project of mutual interest. This course serves as an alternative to PSYCH 357. Contact the course coordinator for details.

OPTOM 442 F 3C 0.5
Advanced Contact Lens Practice
A series of lectures and practical demonstrations of the principles and procedures of advanced contact lens materials and resources including their physiological implications.
Prereq: OPTOM 347

OPTOM 448A/B F,W 2C 0.5
Optometry Clinic
Optometry students are taught how to provide full scope optometric care within a clinical environment. In addition to primary care, students are instructed in the provision of ocular health, electrodiagnostic, binocular vision, contact lens, aniseikonia, low vision and optical services to the clinic patient population. Students also take part in a variety of outreach programs which provide optometric services to special populations including geriatric, preschool and mentally retarded groups. Practical and oral comprehensive examinations in clinical optometry are held in the final examination period of the winter term. Students may be allowed no more than two attempts to pass all parts of the comprehensive examinations. Repeated failure of these examinations may result in dismissal from the program.
Prereq: OPTOM 348A/B, 364, 418

OPTOM 449 F 4C 0.5
Community Health Optometry
Governmental and social aspects of health and vision care delivery are discussed in relation to the epidemiology of vision problems.

OPTOM 451 W 3L 0.5
Optometry Research Project
A continuation of 441. An elective may be chosen as an alternative to OPTOM 451.
Prereq: OPTOM 441

OPTOM 452 W 2C 0.5
Special Populations
A. Visual Aspects of Learning Difficulties. The aspects of vision problems related to learning difficulty including tests and measurements taken by optometrists. The role of the optometrist in conjunction with the parents, teachers, and psychologists in assisting children to achieve is discussed.
B. Elderly or Mentally Retarded Populations. The optometrical management of problems of the elderly, and of mentally retarded individuals. The effect of aging on the visual system. Special vision problems associated with mental retardation.
Prereq: OPTOM 342, 352, PSYCH 101
Course Descriptions
Optometry
Peace and Conflict Studies

B) INTERDISCIPLINARY PACS COURSES

PACS 230 F 3S 0.5
The Politics of Nonviolence
An examination of the possibilities of a nonviolent approach to resolving human conflict with special emphasis on the nature and uses of power, the nature of the nation state and the problem of relating a personal ideal to the realities of communal life.

PACS 250 F,S 3S 0.5
The Nuclear Crisis
A team-taught analysis of the characteristics, capabilities and environmental implications of nuclear weapons; of historical and contemporary origins of the arms race and disarmament efforts; and of psychological and philosophical issues related to the arms race, deterrence and disarmament.

PACS 271 F 3S 0.5
Introduction to Peace Research 1
A study of current research in the developing field of "peace research" including studies of personality and aggression, international tension, issues related to the arms race and disarmament efforts; and of psychological and philosophical issues related to the arms race, deterrence and disarmament.

PACS 272 W 3S 0.5
Introduction to Peace Research 2
A continuation of PACS 271, above.

PACS 350 3S 0.5
Canada and the Nuclear Crisis
An examination of Canadian Public policy responses to nuclear weapons including Canadian participation in weapons production, membership in a nuclear alliance and other defence agreements, and Canadian initiatives in arms control and disarmament.

PACS 390A/B F,W,S P 0.5/0.5
Field Studies in Peace and Conflict
An independent study course requiring reading, research and a paper on issues related to the application of peace and conflict studies theory within a field setting, either in Canada or abroad.
Personnel Studies
(formerly Personnel and Administrative Studies)

Undergraduate Officer
E.S. Lucy, NH 2051, ext. 4551

PERST 200 F,W 2L 0.5
Basic Personnel Administration
Examine the major area of Personnel Administration including recruiting, salary administration, labour relations, benefit administration, employee relations, labour law, and organizational behaviour. Reviews the role of Personnel Administration in all organizations and the manner in which Personnel executives contribute to the well being of a total enterprise.

Prereq: Enrolment in an Honours Program

PERST 300 W 3S 0.5
Concepts and Issues in Personnel Administration
Course is taught using case method and experiential learning. Students participate in interviews, negotiate a collective agreement, decide an arbitration case, develop performance reviews, determine corporate human relations policies, develop a salary and benefit program, and pursue special projects in their area of special interest.

Prereq: PERST 200 and intention to complete a Personnel Studies Minor

Philosophy

Undergraduate Officer
W.R. Abbott, HH 326, ext. 2660

Courses not offered in the current academic year are listed at the end of this section.

Introductory Notes

1. Students must consult the Department before preregistering in upper-year courses. Final details of the courses which will actually be offered in the next academic year, including special subject courses, are available at preregistration time.

2. Any two term courses in philosophy can be used to satisfy the Group A(i) requirements.

3. Courses suffixed with "J" are administered by St. Jerome's College.

PHIL 100 F,W,S 3C 0.5
Introduction to Philosophy
What can we know? What is real? Are moral choices and politics based on reason? Are human beings really just machines? Does God exist? The goal of the course is to promote critical reasoning about these issues which touch your beliefs and lives.

Prereq: No prerequisite

PHIL 102B W 3C 0.5
Introduction to Social and Political Philosophy
An introduction to basic concepts and principles in classic and contemporary social and political philosophy. Differing views on basic questions are examined, with applications to such issues as capital punishment, welfare provisions, taxation, natural resource ownership, and terrorism.

PHIL 102C W 3C 0.5
Philosophy of Life
"Who am I?" "What can I hope for after death?" "How can I test what to do?" "What can I know?" are questions that have led many to philosophize. The course will examine what lifestyles and attitudes major philosophers, stoics, skeptics, pleasure-seekers, mystics, pragmatists, etc. have promoted, and why.

PHIL 118J F 3C 0.5
The Moral Life
An examination of the importance of virtue in general and of the cardinal virtues in particular for the development of character and the enjoyment of the good life.

PHIL 120J F 3C 0.5
Philosophy of Life and Death
A study of what some of the great philosophers have said about the meaning of life and death and the transition from life to death. Students are urged to raise questions and help direct discussion.

PHIL 130J W 3C 0.5
Philosophy of Discontent
A study of what some of the great philosophers have said about the causes of discontent. Social disobedience and the extent to which ethical principles can be altered to accommodate changing conditions are possible topics for discussion.

PHIL 140 F,W,S 3C 0.5
Introduction to Formal Logic
Elementary sentence and predicate logic. Translation from English into formalism, decision methods and deductions. This course is a preparation for courses in the foundations of mathematics, scientific methods, and more advanced logic courses.

PHIL 145 F,W,S 3C 0.5
Critical Thinking
An analysis of basic types of reasoning, structure of arguments, critical assessment of information, common fallacies, problems of clarity and meaning.
PHIL 200A/B
Great Works of Western Philosophy
An examination of some of the greatest writings in Western Philosophy. Students will be encouraged to come to a critical appreciation of such masterworks as Plato's Republic, Descartes' Discourse on Method, Hobbes' Leviathan, Hume's Enquiry, Kant's Prolegomena, Nietzsche's Zarathustra, and an outstanding work in contemporary philosophy.

PHIL 200A F,S 3C 0.5
Great Works of Western Philosophy: Part 1
Outstanding works from the ancient and medieval periods.
Touched in French in the Fall term.

PHIL 200B W 3C 0.5
Great Works of Western Philosophy: Part 2
Outstanding works from the early modern and contemporary periods.
Either PHIL 200A or PHIL 200B may be taken separately.

PHIL 200J F 3C 0.5
Intentional Logic
An introduction to the understanding of how words are used, the formation of propositions, the construction of arguments and the examination of fallacies to help the student argue with order, facility and without error.

PHIL 201 3C 0.5
Love
A philosophical analysis of different forms and functions of love. Among the topics to be considered: love and sexuality, religious love, love and knowledge. Classical and contemporary sources will be treated.

PHIL 202 F 3C 0.5
Philosophy of Women and Men
A study of issues arising from current relations between men and women: masculinity, femininity and androgyny; love; marriage and its alternatives; sexuality, parenthood, abortion, pornography, rape.

PHIL 204 J 3C 0.5
Philosophy and Culture
An analysis of the philosophical assumptions of Western popular culture as reflected in various mass media and in current models of production and consumption.

PHIL 205 J F 3C 0.5
Philosophy of Nature
An examination of ancient and modern accounts of the natural world. Problems include whether matter alone can account for change, whether there is more than one cause, whether nature operates by purpose or chance.

PHIL 206 J W 3C 0.5
Philosophy of Science
A philosophical study of the approaches to the material world used by contemporary physical science. The nature and value of the experimental method in the writings of scientists past and present will be examined.

PHIL 207 3C 0.5
Science, Technology, and Society
Alternative philosophical perspectives on problems raised by scientific and technological developments including moral issues (e.g. privacy and data-gathering, "clean" vs. "dirty" energy). Also an examination of the nature and scope of scientific and technical knowledge as it bears on the responsibilities of scientists and engineers.

PHIL 209 3C 0.5
Philosophy in Literature
Philosophical themes (such as alienation, freedom and responsibility) will be explored through appropriate literary works (for example, works by Aeschylus, Dostoevsky, Kafka, and Twain).

PHIL 210 J F 3C 0.5
Moral Issues
The aim of this course is to improve the student's understanding of ethical ideas and principles by careful discussion of selected concrete moral issues, such as abortion, euthanasia, capital punishment, and violence. Choice of issues is partly determined by student interest.

PHIL 211 F 3C 0.5
Ethics 1
This course is intended to be both a history of and an introduction to moral philosophy. Views on the foundations of ethics of the great philosophers from classical antiquity to about 1900 are systematically examined. Writers studied include: Plato, Aristotle, Aquinas, Kant, Mill and Nietzsche.

PHIL 215 F,W 3C 0.5
Professional and Business Ethics
Study of ethical and moral issues that typically arise in professional and business activity. What responsibilities to society at large do people in such business and professional activities as teaching, engineering, planning, architecture and accounting have? How far should professional autonomy extend?
PHIL 226 F 3C 0.5
Ethics and the Life Sciences
An investigation of some critical ethical issues in human research and therapy. Includes discussions of the right to live and the right to die, behaviour control (e.g. psychosurgery, behaviour modification and psychotherapy), human experimentation (including "informed consent" and fatal research) and genetic engineering.
Offered at Conrad Grebel College.

PHIL 230J W 3C 0.5
God and Philosophy
An investigation of several aspects concerning the meaning and existence of God. Is God-talk possible? Can faith and reason be reconciled? Is religious experience a meaningful argument? A wide range of different views will be considered.

PHIL 236 W 3C 0.5
Magic, Mysticism, and the Occult
A critical philosophical discussion of reports of several kinds of extraordinary experiences, such as magic, extrasensory perception, mysticism, and divination will lead us to discussion of such concepts as insanity, irrationality, the supernatural, and the miraculous.

PHIL 241 F 3C 0.5
Intermediate Logic
Axiom systems of logic are developed and compared with natural deduction procedures. Then certain properties of these logical systems, such as consistency, completeness and compactness, will be investigated.
Prereq: PHIL 140 or consent of the instructor.

PHIL 242 3C 0.5
Extensions and Applications of Elementary Logic
The classical logic introduced in PHIL 140 will be extended to form systems of modal logic, including logics of obligation, belief and knowledge, necessarily, and temporal order. Essentialism, future contingencies, proofs for the existence of God will be discussed.
Prereq: PHIL 140 or consent of the instructor.

PHIL 243 3C 0.5
Conflict, Contract and Choice
Basic concepts of game and decision theory are introduced and applied to ethical theory and problems in social philosophy.
Prereq: PHIL 140, 145 or consent of instructor.

PHIL 245 3C 0.5
Critical Thinking II
An analysis of more complex types of reasoning, including statistical reasoning, decision strategies, and reasoning involving causes and correlations. Emphasis is placed on the analysis of concrete examples.
Prereq: PHIL 145 or 140 recommended.

PHIL 258 3C 0.5
Introduction to the Philosophy of Science
A discussion of the fundamental concepts on which science is based. Consideration is given to such topics as scientific theories, the nature of law-likeness, the grounds for scientific confirmation, and the debate between rationalism and empiricism in science.

PHIL 256J W 3C 0.5
Issues in Higher Education
Why go to university? What are the present realities in Canada? What is the role of the liberal arts? The primary interest will be upon what can be done in practice rather than upon ideal schemes.

PHIL 265 F 3C 0.5
The Existentialist Experience
An introduction to the existentialist view of man using both literary and philosophical texts from such authors as Kierkegaard, Unamuno, Nietzsche, Ortega y Gasset, Camus, Sartre, Heidegger and others.

PHIL 300 W 3C 0.5
Sources of Twentieth-Century Thought
An examination of major writings that have shaped present-day consciousness. Works by such thinkers as Marx, Darwin, Freud, Nietzsche and Mill will be included.

PHIL 301J F 3C 0.5
The Western Philosophical Tradition (1600 to present)
An intensive overview of the major recurring themes in Western intellectual history from both an historical and philosophical viewpoint. Descartes to Existentialism.
Prereq: Second-year standing

PHIL 302 3C 0.5
Modern Feminism
A critical examination of contemporary feminist thought in philosophy, focusing on topics of current concern to feminist writers and to the class.
Prereq: Consent of instructor

PHIL 311 F 3C 0.5
Philosophy of Education 1
A philosophical analysis of classical and contemporary theories of education, with a view to formulating a clear workable concept of education, its aims and methods.
Prereq: At least second-year standing or consent of instructor

PHIL 312 W 3C 0.5
Philosophy of Education 2
An introduction to current work in the field. Issues to be considered may include: the desirability and content of a core curriculum, methods of moral development, the problem of indoctrination, gender and education, computers and education, and peace education.

PHIL 315 W 3C 0.5
Ethics and the Engineering Profession
An analysis from the standpoint of philosophical ethics of moral issues arising in professional engineering practices. Issues include the social responsibility of engineers, conflict of interest and obligation, morally acceptable levels of risk, and moral implications of technology.
Cross-listed as GEN E 412
Offered at Conrad Grebel College.

PHIL 318J W 3C 0.5
Philosophy of the Family
A philosophical examination of the family: its foundation, its purpose, its importance in personal growth, and its relationship to political community.
Prereq: One course in moral philosophy, or consent of the instructor

PHIL 319 J W 3C 0.5
Bioethics
Discussion and analysis, with special attention to Roman Catholic thinkers, of life-sustaining technologies and ethical issues concerning euthanasia, and life-initiating technologies and ethical issues concerning human generation. Legal, economic and social aspects are also examined.
PHIL 322 W 3C 0.5
Contemporary Ethical Theory
Continues the history and discussion of ethics begun in PHIL 221 with writings from 1900 to the present. Theories such as intuitionism, emotivism, utilitarianism, and relativism are examined via the writings of such people as Moore, Hare and Warnock.
Prereq: PHIL 221 recommended

PHIL 327A F 3C 0.5
Philosophy of Law: Part 1
Basic themes in the philosophy of law. Issues include the nature of law and its relation to morality and politics, legal reasoning, the justification of punishment, and theories of rights, responsibility and liability.

PHIL 327B 3C 0.5
Philosophy of Law: Part 2
An examination of areas within the law in which philosophical problems and methods are featured prominently, with special focus on the Canadian constitution and legal process, and such issues as the conflict between collective and individual rights.
Prereq: PHIL 327A or consent of the instructor

PHIL 329 C 0.5
War, Peace and Justice
An intensive study of the moral issues involved in war and armed revolution. Critical evaluation of "just war" theories and international rules of warfare is pursued as well as the moral arguments for and against pacifism and conscientious objection.
Prereq: PHIL 102B or 322 or consent of instructor
Offered at Conrad Grebel College.

PHIL 331 3C 0.5
Aesthetics
Philosophical consideration of works of art and the problems of beauty using selected readings to enable the student to recognize and formulate his own views in a philosophic manner.
Prereq: Two term courses in Philosophy or consent of instructor

PHIL 350 3C 0.5
Epistemology 1
An examination of such problems as meaning criteria, primary data, and the importance of certainty to knowledge.
Prereq: Two term courses in Philosophy

PHIL 351 3C 0.5
Epistemology 2
An examination of the problem of defining knowledge, of naturalized epistemology, and of such problems as a priori knowledge and the existence of other minds.
Prereq: Two term courses in Philosophy

PHIL 355 3C 0.5
Philosophy of the Formal Sciences
A study of philosophical problems concerning mathematics. Topics discussed include formalism, intuitionism, logicism, the mathematical paradoxes, and other topics in foundations and metamathematics.
Prereq: At least second-year standing or consent of instructor

PHIL 359 3C 0.5
Philosophy of the Social Sciences
Problems about the fundamental methods and aims of the social sciences generally, and problems specific to Psychology, Sociology, Political Science, etc., and their relations to one another will be considered.
Cross-listed as SOC 371

PHIL 370-375 3C 0.5
Special Topics
One or more term courses will be offered at different times, as announced by the Department.
Prereq: Consent of instructor

PHIL 376 3C 0.5
American Philosophy
A survey of the leading ideas of classical American philosophers, including Peirce, James, Royce, Santayana, Dewey and Mead. Attention will be paid to certain common themes, such as the pragmatic theory of truth, and the concept of democratic community. An effort will also be made to determine what makes these views distinctively American.
Prereq: One term course in Philosophy or consent of instructor

PHIL 380 F 3C 0.5
History of Ancient Philosophy
From the beginnings to Plato.
Prereq: One term course in Philosophy or consent of instructor
Cross-listed as CLAS 361
Offered at St. Jerome's College

PHIL 381 W 3C 0.5
History of Ancient Philosophy
From Aristotle to the close of classical antiquity.
Prereq: One term course in Philosophy or consent of instructor
Cross-listed as CLAS 362
Offered at St. Jerome's College

PHIL 382 3C 0.5
Medieval Philosophy 1
The early period to the 13th century. Among those considered will be: Augustine, Boethius, Anselm and Abelard.
Prereq: One term course in Philosophy or consent of instructor

PHIL 383 3C 0.5
Medieval Philosophy 2
The later period from the 13th century. Among those considered will be: Bonaventure, Aquinas, Scotus, and Ockham.
Prereq: One term course in Philosophy or consent of instructor

PHIL 384 F 3C 0.5
History of Modern Philosophy 1
Earlier period beginning with Descartes.
Prereq: One term course in Philosophy or consent of instructor

PHIL 385 W 3C 0.5
History of Modern Philosophy 2
Later period including Hume and Kant.
Prereq: One term course in Philosophy or consent of instructor

PHIL 387 W 3C 0.5
19th Century Philosophy
The 19th century Philosophers covered may include Hegel, Mill, Schopenhauer, James and Kierkegaard.
Prereq: One term course in Philosophy or consent of instructor

PHIL 387 W 3C 0.5
20th Century Philosophy
A study of major themes of 20th century philosophy through representative works of Russell, Moore, Carnap, Wittgenstein, Husserl and others.
Prereq: One term course in Philosophy or consent of instructor

PHIL 396J-397J F,W 0.5 each
Special Topics/Directed Readings
A series of readings and/or seminars on one or two topics or thinkers, with periodic reports and discussions.
Prereq: Consent of instructor, permission of the College Discipline Co-ordinator, and approval of the College Academic Committee
PHIL 420/421 3C 0.5
Studies in Ethics
Special topics in ethics, as announced by the Department.
Prereq: At least one term course in ethics

PHIL 422 3C 0.5
Political Philosophy 1
Philosophical analysis of central concepts in political theory and its relation to moral and metaphysical problems of various periods.
Prereq: At least one term course in ethics

PHIL 423 3C 0.5
Political Philosophy 2
A detailed discussion of contemporary theories.
Prereq: At least one term course in ethics

PHIL 435/436 3C 0.5
Studies in Philosophy of Religion
A study of a particular philosopher or problem, as announced by the Department.
Prereq: Consent of instructor

PHIL 440A/B
Logical Theory
A rigorous and general development of the propositional and predicate calculus within which alternative calculi are examined. Study of such concepts as completeness, consistency, extensionality, and modality from both formal and philosophical points of view. Intended primarily for those interested in philosophical issues connected with logic.
Prereq: At least one term course in formal logic, or consent of instructor

PHIL 440A 3C 0.5
Logical Theory
The first part of PHIL 440.

PHIL 440R 3C 0.5
Logical Theory
The second part of PHIL 440.

PHIL 441/442 3C 0.5
Studies in Logic
Special topics in logic, as announced by the Department.
Prereq: At least one of: PHIL 241, 242, 440A, 440B, PMATH 430A

PHIL 443
Creative Thinking, Problem Solving and Decision Making
Problem solving, including Assessment of Risk, Uncertainty and Value form one part of the course. Other subjects include Individual and Group Process for Finding and Weighing Alternatives; Organization of Data, its Presentation and Analysis.

PHIL 450J F 3C 0.5
Being and Existence
A discussion of the notions of reality, being, essence, existence, analogy, etc. The techniques of linguistic analysis will be employed. Also, the very possibility of any kind of metaphysics will be discussed.
Prereq: Third-year standing or consent of instructor

PHIL 451J W 3C 0.5
The Thomistic Tradition in Philosophy
An examination of the work of Thomas Aquinas, his philosophical relation to his times, and the revival of Thomism in the modern era.
Prereq: Two term courses in Philosophy and third-year standing, or consent of instructor

PHIL 455 3C 0.5
Metaphysics 1: Ontology
Studies in the nature of being, with special emphasis on material objects and their properties, and on causation.
Prereq: Consent of instructor

PHIL 456 3C 0.5
Metaphysics 2: Cosmology
Metaphysical problems in the areas of space, time and motion.
Prereq: Consent of instructor

PHIL 463 3C 0.5
Philosophy of Language
Issues in the philosophy of language, such as synonymy, propositions, meaning, semantics, reference.
Prereq: At least two term courses in philosophy or consent of instructor

PHIL 464 3C 0.5
Philosophy as Linguistic Analysis
A consideration of ordinary language analysis as a method for solving philosophical problems, and a comparison of it with structural linguistics.
Prereq: At least two term courses in philosophy or consent of instructor

PHIL 465 3C 0.5
Existential Philosophy
An in depth study of the thoughts of a major figure such as Kierkegaard, Unamuno, Nietzsche, Heidegger, Sartre, Camus, Marcel, Jaspers, Ortega y Gasset.
Prereq: Consent of instructor

PHIL 470 3C 0.5
Phenomenology
A critical examination of the issues and methods of phenomenology, including the attempts to understand the uses and ramifications of phenomenological methods through the working out of particular analyses. The basic writings of phenomenologists such as Husserl and Merleau-Ponty will be used.
Prereq: Two term courses in Philosophy or consent of instructor

PHIL 471-484 3C 0.5
Special Subjects
One or more term courses will be offered at different times, as announced by the Department.
Prereq: Consent of instructor

PHIL 496J-497J F,W 0.5 each
Special Topics/Directed Readings
A series of readings and/or seminars on one or two topics or thinkers, with periodic reports and discussions.
Prereq: Consent of instructor, permission of the College Discipline Co-ordinator, and approval of the College Academic Committee

PHIL 499A-N F,W,S R 0.5
Directed Reading in Special Areas
Prereq: Consent of instructor

PHIL 499A/B 0.5/0.5
Senior Seminar and Honours Essay
All senior honours students attend this seminar in which a selection of major philosophical problems is discussed. They will also prepare a senior essay and discuss it with this group.
A letter grade for PHIL 499A will be submitted only after the completion of PHIL 499B or PHIL 499J.

PHIL 499J F,W 0.5
Tutorial and Honours Essay
Students wishing to enrol in 499J should consult the St. Jerome's College Discipline Co-ordinator.
Prereq: PHIL 499A

PHIL 499K F,W 0.5
Senior Seminar
A discussion of philosophical problems with particular emphasis on the works of the following: Aquinas, Barrows, Bonhoeffer, Berkeley, Bergson, Black, Morley, and White.
Physics

Undergraduate Officers
H.K. Ellenton, PHY 241, ext. 2224
K.A. Woolner, PHY 243, ext. 2848

Courses not offered in the current academic year are listed at the end of this section.

Introductory Note
Prerequisites are given as a guide to the student and may be waived with the consent of the instructor.

PHYS 001 0.0
Pre-University Physics
This course covers the topics in Ontario Grades 11 to 13 essential for first year university physics. The course includes mechanics, gravitation, vibrations and waves, heat, electricity, light and optics. Successful completion of this course fulfills the University admission requirements where high school Physics is necessary.

No University Credit
Offered by Correspondence only

PHYS 010 F,W,S 1C 0.0
Physics Seminar
This seminar brings together Honours Physics (Regular and Co-op) students in all years to hear invited speakers, view physics-related films, and learn about current research.

PHYS 103 W 3C,3L,2T 0.5
Mechanics in Human Movement
An introduction to the physical principles required for the analysis of the mechanics of human movement; includes particle kinematics and dynamics, statics, work and energy, conservation of energy and linear momentum, rotational kinematics and dynamics, and conservation of angular momentum.

Prereq: MATH 106
For Kinesiology students
Lab alternate weeks, optional tutorial

PHYS 105 F 3C,3L,2T 0.5
Electrical Science
Basic electricity, magnetism and electronics. An introduction to the physical principles required for an understanding of the electrical measurements and instrumentation used in Kinesiology.

Prereq: PHYS 103
For Kinesiology students
Lab alternate weeks, optional tutorial

PHYS 111 F 3C,1T 0.5
Physics 1
An introduction to physics for students intending to concentrate their further studies in biology, dentistry, medicine and paramedicine; includes particle kinematics and dynamics, energy and momentum conservation, gravitation, rotational mechanics, properties of liquids, temperature and heat.

PHYS 111L F 3L 0.25
Physics 1 Laboratory
For students taking PHYS 111.
Lab alternate weeks

PHYS 112 W,S 3C,1T 0.5
Physics 2
A continuation of PHYS 111; includes simple harmonic motion, electrostatic force and potential, electric current and power, DC circuits, magnetic field and induction, wave motion, sound, light, optics and nuclear physics.

Prereq: PHYS 111 or PHYS 121

PHYS 112L W,S 3L 0.25
Physics 2 Laboratory
For students taking PHYS 112.
Lab alternate weeks

PHYS 115 F 3C,2T 0.5
Mechanics

For students in Year One Engineering

PHYS 121 F 3C,1T 0.5
Mechanics, Wave Motion and Heat 1
An introductory course in physics for students intending to concentrate their future studies in the physical sciences, optometry or mathematics; includes particle kinematics and dynamics, forces in nature, work and energy, conservation of energy and linear momentum, rotational kinematics and dynamics, and conservation of angular momentum.

Prereq: OAC Calculus and at least one other OAC math. OAC Physics recommended.
Science students must take 121L with this course

PHYS 121L F 3L 0.25
Mechanics, Wave Motion and Heat 1 Laboratory
For students taking PHYS 121.
Lab alternate weeks

PHYS 122 W,S 3C,1T 0.5
Mechanics, Wave Motion and Heat 2
This course is a continuation of PHYS 121; includes oscillating systems, wave motion, gravitation, fluid mechanics, heat and thermodynamics.

Prereq: PHYS 121
Science students must take 122L with this course

PHYS 122L W,S 3L 0.25
Mechanics, Wave Motion and Heat 2 Laboratory
For students taking PHYS 122.
Lab alternate weeks

PHYS 123 F 3C 0.5
Digital Computation
Introduction to computer applications in physics. Numerical solution of problems in classical mechanics. Storage, analysis, and display of experimental data. Graphical techniques for constructing field plots and solving the Schrödinger equation.

For Co-op Physics students or students intending to major in Physics
Prereq: CS 102

PHYS 125 W,S 3C,2T 0.5
Physics for Engineers
Oscillations; simple harmonic motion. Wave motion, travelling and standing waves; transverse and longitudinal waves, including sound. Geometrical optics; reflection and refraction. Physical optics; interference and diffraction. Quantum physics; quantization of radiation; hydrogen atom.

Prereq: PHYS 115

PHYS 125 L W,S 3L 0.25
Physics for Engineers Laboratory
For students taking PHYS 125.
Lab alternate weeks
<table>
<thead>
<tr>
<th>Course Descriptions</th>
<th>16:115</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PHYS 222</strong> F 0.5</td>
<td><strong>PHYS 253L</strong> W,S 3L 0.25</td>
</tr>
<tr>
<td><strong>Electricity and Magnetism 1</strong></td>
<td><strong>Electricity and Magnetism Laboratory</strong></td>
</tr>
<tr>
<td>Coulomb's law, electric field, Gauss's law, potential, capacitance, properties of dielectrics, current, resistance, electromagnetic force, D.C. circuits and instruments.</td>
<td>For students taking PHYS 253.</td>
</tr>
<tr>
<td>Prereq: First year physics and calculus</td>
<td>Lab alternate weeks</td>
</tr>
<tr>
<td>Not for students in the Honours Physics Program</td>
<td></td>
</tr>
<tr>
<td><strong>PHYS 223</strong> W 0.5</td>
<td><strong>PHYS 256 F 3C 0.5</strong></td>
</tr>
<tr>
<td><strong>Electricity and Magnetism 2</strong></td>
<td><strong>Geometrical and Physical Optics</strong></td>
</tr>
<tr>
<td>Prereq: PHYS 222</td>
<td>Prereq: First year physics and calculus</td>
</tr>
<tr>
<td>Not for students in the Honours Physics Program</td>
<td>Physics majors must take 256L with this course</td>
</tr>
<tr>
<td><strong>PHYS 224L</strong> F 3L 0.25</td>
<td><strong>PHYS 258 F 3C 0.5</strong></td>
</tr>
<tr>
<td><strong>Electricity and Geometrical Optics Laboratory</strong></td>
<td><strong>Optics Laboratory</strong></td>
</tr>
<tr>
<td>For students taking both 222 and 226. Lab alternate weeks</td>
<td>For students taking PHYS 256.</td>
</tr>
<tr>
<td><strong>PHYS 225L</strong> W 3L 0.25</td>
<td><strong>Lab alternate weeks</strong></td>
</tr>
<tr>
<td><strong>Magnetism and Physical Optics Laboratory</strong></td>
<td></td>
</tr>
<tr>
<td>For students taking both 223 and 246. Lab alternate weeks</td>
<td></td>
</tr>
<tr>
<td><strong>PHYS 226 F 2C,1T 0.5</strong></td>
<td><strong>PHYS 263 W,S 3C 0.5</strong></td>
</tr>
<tr>
<td><strong>Geometrical Optics</strong></td>
<td><strong>Classical Mechanics 1</strong></td>
</tr>
<tr>
<td>Fermat's principle, reflection and refraction at plane and spherical surfaces, thin and thick lenses, optical instruments such as magnifiers, microscopes, telescopes, spectrometers, normal magnification.</td>
<td>Newtonian dynamics of particles and systems of particles: resisted motion, gravitation, central-force motion, noninertial frames, oscillations, normal modes.</td>
</tr>
<tr>
<td>Prereq: First year physics and calculus</td>
<td>Prereq: First year physics and calculus</td>
</tr>
<tr>
<td>Not for students in the Honours Physics Program</td>
<td>Coreq: PHYS 259L</td>
</tr>
<tr>
<td><strong>PHYS 234 W,S 3C 0.5</strong></td>
<td><strong>Strongly recommended for students planning to take PHYS 435 (Solid State Physics). May be taken in either second or third year</strong></td>
</tr>
<tr>
<td><strong>Quantum Physics 1</strong></td>
<td></td>
</tr>
<tr>
<td>Special theory of relativity. Background of quantum physics. Quantization, waves and particles. The Schrödinger equation. Significance of the wave function. Bound states in potential wells. Travelling waves and transmission through barriers in one dimension.</td>
<td></td>
</tr>
<tr>
<td>Prereq: First year physics and calculus</td>
<td></td>
</tr>
<tr>
<td><strong>PHYS 235 L 3L 0.25</strong></td>
<td><strong>PHYS 259L W,S 3L 0.25</strong></td>
</tr>
<tr>
<td><strong>Crystallography and X-Ray Diffraction</strong></td>
<td><strong>Crystallography and X-Ray Diffraction Laboratory</strong></td>
</tr>
<tr>
<td>Space lattices, symmetry, crystal geometry and structure, stereographic projections. X-ray production, theory of X-ray diffraction and X-ray methods, crystal structure determination, the reciprocal lattice. Optional topics such as crystal formation, crystal defects, electron and neutron diffraction.</td>
<td>For students taking PHYS 259. Lab alternate weeks</td>
</tr>
<tr>
<td>Coreq: PHYS 259L</td>
<td></td>
</tr>
<tr>
<td><strong>PHYS 236 W,S 3C 0.5</strong></td>
<td><strong>PHYS 266 W,S 3C 0.5</strong></td>
</tr>
<tr>
<td><strong>Quantum Mechanics 1</strong></td>
<td><strong>Optics Laboratory</strong></td>
</tr>
<tr>
<td>Wave mechanics and quantum theory. Basic principles of quantum mechanics. Wave-particle duality, quantum states, eigenfunctions, observables, expectation values.</td>
<td>For students taking PHYS 256. Lab alternate weeks</td>
</tr>
<tr>
<td>Prereq: First year physics and calculus</td>
<td></td>
</tr>
<tr>
<td><strong>PHYS 246 W 3C,1T 0.5</strong></td>
<td><strong>PHYS 271 W,S 3C 0.5</strong></td>
</tr>
<tr>
<td><strong>Physical Optics</strong></td>
<td><strong>Putting It Together Laboratory</strong></td>
</tr>
<tr>
<td>Nature of light, wave motion, superposition of waves, interference of light, Fraunhofer diffraction and resolution limit of optical instruments; the diffraction grating and the analysis of light. Fresnel diffraction. Polarized light. Coherence of light, lasers, holography. Fibre optics.</td>
<td>For students taking PHYS 271. Lab alternate weeks</td>
</tr>
<tr>
<td>Prereq: First year physics and calculus</td>
<td>For students in the Honours Chemistry, Regular and Co-operative Applied Physics Program</td>
</tr>
<tr>
<td><strong>PHYS 247F,S 3C 0.5</strong></td>
<td><strong>PHYS 272 W,S 3C 0.5</strong></td>
</tr>
<tr>
<td><strong>Introduction to Waves and Diffraction</strong></td>
<td><strong>Electrical Systems Laboratory</strong></td>
</tr>
<tr>
<td>Prereq: First year physics</td>
<td>For students in the Honours Chemistry, Regular and Co-operative Applied Physics Program</td>
</tr>
<tr>
<td>Antireq: PHYS 246, 256, 259</td>
<td>Coreq: PHYS 272L</td>
</tr>
<tr>
<td><strong>PHYS 248L F 3S 3L 0.25</strong></td>
<td><strong>PHYS 281 W,S 3C 0.5</strong></td>
</tr>
<tr>
<td><strong>Diffraction Laboratory</strong></td>
<td><strong>Elasticity Laboratory</strong></td>
</tr>
<tr>
<td>For students taking PHYS 248. Lab alternate weeks</td>
<td>For students taking PHYS 281. Lab alternate weeks</td>
</tr>
<tr>
<td><strong>PHYS 252 F 3C 0.5</strong></td>
<td><strong>PHYS 287 W,S 3C 0.5</strong></td>
</tr>
<tr>
<td><strong>Electricity and Magnetism 1</strong></td>
<td><strong>Elasticity Laboratory</strong></td>
</tr>
<tr>
<td>Coulomb's law, electric fields, Gauss's law, potential, capacitance, properties of dielectrics, current, resistance, electromagnetic force, D.C. circuits, A.C. circuits, instrumentation.</td>
<td>For students taking PHYS 287. Lab alternate weeks</td>
</tr>
<tr>
<td>Prereq: First year physics and calculus</td>
<td>Coreq: PHYS 287L</td>
</tr>
<tr>
<td>Coreq: PHYS 252L</td>
<td></td>
</tr>
<tr>
<td><strong>PHYS 252L F 3L 0.25</strong></td>
<td><strong>PHYS 289 W,S 3C 0.5</strong></td>
</tr>
<tr>
<td><strong>Electricity and Magnetism Laboratory</strong></td>
<td><strong>Geometrical and Physical Optics Laboratory</strong></td>
</tr>
<tr>
<td>For students taking PHYS 252. Lab alternate weeks</td>
<td>For students taking PHYS 289. Lab alternate weeks</td>
</tr>
<tr>
<td><strong>PHYS 253 W,S 3C 0.5</strong></td>
<td><strong>PHYS 291 W,S 3C 0.5</strong></td>
</tr>
<tr>
<td><strong>Electricity and Magnetism 2</strong></td>
<td><strong>Classical Mechanics 2</strong></td>
</tr>
<tr>
<td>Prereq: PHYS 252, MATH 216</td>
<td>Prereq: First year physics and calculus, MATH 216</td>
</tr>
<tr>
<td>Coreq: MATH 213B, PHYS 253L</td>
<td></td>
</tr>
</tbody>
</table>
Course Descriptions

Physics

PHYS 275 F 3C 0.5
Astrophysics 1 - The Solar System
The Planets, Newtonian gravity and celestial mechanics, the formation of stars and planets, meteorites, asteroids, comets, planetary interiors, planetary surfaces, planetary atmospheres, the origin of life.
Students with a weak background in Mathematics or Physics are advised to take SCI 238 first

PHYS 326 F 3C 0.5
Modern Physics
Special theory of relativity, quantization of electromagnetic radiation, wave properties of particles, the hydrogen atom.
Not for students in the Honours Physics program

PHYS 334 F,S 3C 0.5
Quantum Physics 2
Prereq: PHYS 234, MATH 213A/B

PHYS 352 F,S 3C 0.5
Analogic Electronics
p and n materials, pn diodes, junction and FET transistors. Transistor amplifiers and their equivalent circuits. Operational amplifiers. Oscillators and power supplies.
Prereq: Knowledge of determinants, elementary calculus and elementary electricity
Coreq: 352L

PHYS 352L F,S 3L 0.25
Analogic Electronics Laboratory
For students taking PHYS 352
Lab alternate weeks

PHYS 355 W 3C 0.5
Nuclear Physics
Prereq: PHYS 326 or 334

PHYS 356 F,S 3C 0.5
Thermodynamics
Prereq: PHYS 122, MATH 213A/B and 216

PHYS 359 W 3C 0.5
Statistical Mechanics
Prereq: PHYS 358

PHYS 360A F,S 3L 0.25
Intermediate Laboratory
Selected experiments in mechanics, optics, electronics, atomic, molecular, nuclear and solid state physics.
Prereq: PHYS 121L, 122L and two second year Physics labs
18 hours of experiments

PHYS 360B W 3L 0.25
Intermediate Laboratory
Continuation of 360A.
Prereq: PHYS 263, MATH 213A/B
18 hours of experiments

PHYS 364 F,S 3C 0.5
Mathematical Physics 1
Prereq: MATH 213A/B and 216
Primarily intended for Honours Physics students

PHYS 365 W 3C 0.5
Mathematical Physics 2
Cartesian tensors. Invariance, Matrix algebra. Introduction to the use of Complex Variable theory. Fourier and other transforms.
Prereq: MATH 213A/B and 216
Primarily intended for Honours Physics students

PHYS 368 F 2C 0.5
Geophysics 1
Prereq: PHYS 121/122, MATH 113A/B. MATH 216 recommended
Cross-listed as EARTH 368

PHYS 369 W 3C 0.5
Geophysics 2
Prereq: PHYS 121/122, MATH 113A/B. MATH 216 recommended
Cross-listed as EARTH 369

PHYS 371A F,S 3L 0.25
Intermediate Laboratory
Further experiments in mechanics, optics, electronics, atomic, molecular, nuclear and solid state physics.
18 hours of experiments

PHYS 371B W 3L 0.25
Intermediate Laboratory
Continuation of 371A. For honours students who are taking PHYS 360B.
18 hours of experiments

PHYS 375 W 3C 0.5
Astrophysics 2 - Stars and Stellar Evolution
Observational techniques, spectral classification, stellar motions and distances, open clusters, globular clusters, stellar populations, theory of the structure, atmosphere, formation and evolution of stars.
Prereq: Years 1 and 2 Physics and Calculus, and some familiarity with programming and stellar terminology.
PHYS 380 W 3C 0.5
Molecular Biophysics
Behaviour of biological macromolecules, protein structure and function, weak interactions, physical techniques for determination of macromolecular structure, and function of nucleic acids, protein synthesis, energy in biological systems, molecular growth and evolution.
Prereq: Year One Physics and Chemistry, or consent of instructor.

PHYS 381 F 3C 0.5
Cellular Biophysics
Structure and function of cellular membranes, membrane lipid and protein structure and dynamics, membrane potential and ion transport, nerve conduction, vision and interaction of light with membranes, muscle contraction and energy transduction.
Prereq: Year One Physics and Chemistry, or consent of instructor.

PHYS 432 W 3C 0.5
Physics of Solid State Devices
The theories of solid state physics are applied to explain the operation and use of several modern electronic devices, including the p-n junction, transistor, tunnel diode, field effect devices, opto-electronic devices, etc.
Prereq: PHYS 435

PHYS 434 F 3C 0.5
Quantum Physics 3
Prereq: PHYS 334, 364 and 365

PHYS 435 F 3C 0.5
Solid State Physics
Prereq: Completion of Year Three Honours Physics

PHYS 437A F,W P 0.5
Research Project
A research project in any area of Physics approved by the course co-ordinator(s). The student is required to present a summary of the project orally and to submit a written report in a style suitable for publication. Some projects, especially those with an experimental emphasis, will likely continue as 437B. In these cases, students will submit an interim written report, in addition to the oral presentation.
Prereq: Completion of all third year honours physics program requirements and registration in the fourth year of an honours physics program. Students with <70% average in the third year core are advised not to take this course. Enrolment will be limited

PHYS 437B W P 0.5
Research Project (continued)
A continuation of the project undertaken in PHYS 437A. The student is required to present a summary of the project orally or by poster and to submit a written report in a style suitable for publication.
Prereq: Completion of Physcis 437A and approval of the course coordinator(s)

PHYS 441A F 3C 0.5
Electromagnetic Theory
Electrostatics, magnetostatics, and the macroscopic description of dielectrics and magnetic materials. Includes appropriate mathematical techniques, potential theory and the method of images.
Prereq: PHYS 252/253, 364/365

PHYS 441B W 3C 0.5
Electromagnetic Theory
Prereq: PHYS 441A

PHYS 443 W 3C 0.5
Continuum Mechanics
Prereq: PHYS 364/365

PHYS 444 W 3C 0.5
Modern Particle Physics
Prereq: PHYS 334, PHYS 364/365 or equivalent

PHYS 445 W 3C 0.5
Modern Optics
Basic electromagnetic wave theory. Polarization, reflection, refraction, and dispersion. Temporal coherence and spectra. Spatial coherence and diffraction. Spatial filtering, Lasers, modes and beam propagation. Special topics may include crystal optics and nonlinear effects, holography, fibre optics and communications.
Prereq: PHYS 256

PHYS 453 W 3C 0.5
Advanced Analogue Electronics
A variety of topics in the operation of systems. Transistors, modern circuit techniques, noise, stability under feedback, information theory, and possible student motivated topics. Includes laboratory demonstrations.
Prereq: PHYS 352/353

PHYS 454 W 3C 0.5
Quantum Physics 4
Scattering theory. Relativistic wave equations. Quantization of fields.
Prereq: PHYS 434.
PHYS 454 is strongly recommended for students intending to do graduate work

PHYS 463 F 3C 0.5
Classical Mechanics 2
Lagrangian and Hamiltonian Dynamics. Variational principles and Lagrange's equations, Hamilton's equations of motion, Canonical transformations, Hamilton-Jacobi theory.
Prereq: PHYS 263

PHYS 464 F 3C 0.5
Mathematical Physics 3
Topics in mathematical physics, as for example integral equations, Greens functions and complex analysis.
Prereq: PHYS 364/365

PHYS 465 W 3C 0.5
Mathematical Physics 4
Non-linear physics. Dissipative and Hamiltonian systems, integrability, chaos.
Prereq: PHYS 364/365
Planning, Urban and Regional

Undergraduate Officer
S. Herzog, ES 1 304, ext. 3354

Courses not offered in the current academic year are listed at the end of this section.

PLAN 100A F 4C, 1D 0.5
Introduction to Urban and Regional Planning Concepts and Techniques 1
The development of contemporary planning concepts and principles; the nature, purpose and scope of urban planning; the planning process and decision-making in a democratic society. Methodological aspects of designing a planning program: identification of objectives and constraints, conduct of basic surveys and analysis, plans and policies preparation, evaluation and implementation.
Prerequisite: Planning students only
Estimated additional cost to student: $20

PLAN 100B W 4C, 1D 0.5
Introduction to Urban and Regional Planning Concepts and Techniques 2
Continuation of PLAN 100A.
Prerequisites: PLAN 100A, Planning students only
Estimated additional cost to student: $20

PLAN 130 W 3C 0.5
Participatory Planning
An introduction to types of participatory planning initiated either by planners or by citizens' groups and directed toward changing built and natural environments. Concepts such as individualism, class, family, ethnicity and community are introduced in order to show how they relate to environmental attitudes and behavior.
Prerequisites: Planning students only

PLAN 156 W 2C, 1D 0.5
Introduction to Urban and Regional Planning Concepts
An introduction to contemporary planning ideas for students whose subsequent work might bring them in contact with professional planners. Planning concepts and principles; the development of contemporary planning ideas; the nature, purpose and scope of urban and regional planning; the planning process and decision-making in a democratic society.
Prerequisite: None
(Not available for credit to planning students). Restricted to first and second year students in other programs.

PLAN 159 F, W 3rd 0.5
Graphics for Planning
Basic instruction in graphic techniques used in planning. Emphasis will be placed on the use of graphics for the communication of ideas.
Prerequisite: Planning students or consent of instructor
Estimated additional cost to student: $60
Lab fee $15
Materials at student's expense

PLAN 225 F 3C 0.5
Urbanization in the Third World
An analysis of the factors behind the rapid urbanization of selected areas in Asia, Africa and Latin America, with an examination of the related problems of planning and development control policies.
Prerequisite: Faculty of Environmental Studies course or Third World Development Course
Cross-listed as GEOG 225
Students may receive credit for only one of PLAN 225 and GEOG 225

PLAN 232 F 4C 0.5
Rural Planning and Development
Advanced analysis of the process followed for rural planning and development in Canada and other selected countries. Problems and their solutions as noted in various jurisdictions are presented. Emphasis is placed on government approaches to planning and development.
Prerequisite: Second-year Planning students or consent of instructor
Course Descriptions
Planning, Urban and Regional

PLAN 255 W 2C, 2wkshp 0.5
Planning Surveys and Analyses
Sources of data for planning; their assembly and analysis. Emphasizes the sources, methods of collection and analysis of urban and regional data resources. Particular attention paid to data base management and applications related to population projects, transportation and the location of urban facilities. Introduction to the principles of geographic information systems. Oriented toward group research projects. There will be a one-day field excursion.

Prereq: PLAN 100 or consent of instructor

Estimated additional cost to student: $10

PLAN 256A F 2C, 2std 0.5
Environmental Design 1
Design concepts in Urban and Regional Planning, illustrated by recent work. Individual and group projects in planning design in urban and regional settings, using graphic, model and verbal presentations.

Prereq: Second-year Planning or Environmental Studies students with consent of instructor

Studio fee: $10

Estimated additional cost to student for materials: $60

PLAN 256B W 2C, 2std 0.5
Environmental Design 2
Continuation of PLAN 256A.

Prereq: PLAN 256A

Estimated additional cost to student for materials: $60

PLAN 259 W 2C, 2wkshp 0.5
Regional Planning and Economic Development
The relationship of economic planning to regional planning. Concepts of economic development and models of regional development planning. Case studies and examples are drawn from federal regional development efforts in Canada and/or from Third World nations. Workshops focus on regional planning and development at both a conceptual and empirical level.

Prereq: One of PLAN 100, 156 or consent of instructor

PLAN 270 W 2C 0.5
Concepts and Ideas in Contemporary Urban Planning
An overview of the modern movements and philosophical roots underlying urban planning and civic design. Philosophies and contributions of those who have significantly influenced modern historical thought. Development of planning trends and ideas in North America and abroad emphasizing relevance to contemporary concerns.

Prereq: Planning students or consent of instructor

PLAN 275A/B/C F, W, S 3R 0.5
Readings and Research Planning
Special readings and research on planning topics chosen in consultation with an instructor. This course gives the opportunity for supervised individual reading and study of planning or related topics in which the student is particularly interested.

Prereq: PLAN 100 or consent of instructor

Prior to registering for this course, students must arrange with a faculty member to serve as advisor.

The letter designation allows this course to be taken more than once for credit.

PLAN 300A F 3wkshp, 2flab 0.5
Seminar/Workshop Project in Urban and Regional Planning 1
An integrated approach to the analysis of communities; identification and synthesis of factors related to function, structure, environmental context, regional framework, etc., in the preparation of comprehensive development programs. A major project undertaken in small project groups. Project reports summarizing findings are completed and presented at end of term. Field trip related to theme of problems includes follow-up discussion, assignments and preparation of individual research paper.

Prereq: Third-year Planning students only

Estimated additional cost to student: $70

PLAN 300B W, S 3wkshp, 2flab 1.0
Seminar/Workshop Project in Urban and Regional Planning 2
The transformation of analytical concepts of community into planning designs on selected sites. On-site visits, collection and analysis of field data and relevant social, economic, physical and administrative information. Public presentations of analyses, plans and proposals as well as preparation of comprehensive reports.

Prereq: PLAN 300A

PLAN 301 F 4std 0.5
Urban Design
A study of the design of the environment in urban and regional contexts through lectures and studio projects.

Prereq: PLAN 256

Estimated additional cost to student: $40

PLAN 307 F 2C, 1D 0.5
Social Survey Techniques in Planning
Social research and the planning process; interview and self-administered surveys; questionnaire design; sampling, non-survey data collection techniques; practical applications.

Prereq: Second or third-year Planning students with ENV S 178; other ENV S students with consent of instructor

Cross-listed as GEOG 307

Students may receive credit for only one of PLAN 307 and GEOG 307

PLAN 316 W 3S 0.5
Multivariate Statistics
The theory and application of multivariate statistics, with particular emphasis upon the use of the computer.

Prereq: ENV S 278 or consent of instructor

Cross-listed as GEOG 316

Students may receive credit for only one of PLAN 316 and GEOG 316

PLAN 322 S 3C 0.5
Canadian Regional Issues
Selective study of Canadian development issues pertaining to the use of land, urbanization, regional and resource development; issues will be related to structural and functional forces that are characteristic of the major regions of Canada, e.g. Atlantic Provinces, British Columbia.

PLAN 325 W 3C 0.5
Special Topics in Development Planning in the Third World
Focus on centralization, decentralization, local institutional structure, and participatory approaches to regional community development planning. Use of case studies (seminar method). Concepts, principles and methods in practice are critically examined. Provides useful guidelines for students interested in overseas volunteer work and other development projects and programs.

Prereq: Second-year courses in Planning or Third World Development or consent of instructor
### Course Descriptions

**Planning, Urban and Regional**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Units</th>
<th>Prerequisites</th>
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<tbody>
<tr>
<td>PLAN 330 W.S</td>
<td>2C,1S</td>
<td>0.5</td>
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| **Urban Social Planning** |  | This course looks at social planning as a way of attacking urban social problems. Will examine the different types of social planning and the relationship between physical and social planning.  
  Prereq: SOC 101 or consent of instructor |
| PLAN 359 F | 3C | 0.5 |
| **Regional Planning: Program Development and Implementation** |  | An examination of current regional planning programs (objective, policies, strategies and plans), with regard to both their development and implementation in the context of various institutional structures, arrangements and intergovernmental relations. Emphasis will be given to the process of implementing and monitoring programs in different jurisdictional and administrative settings.  
  Prereq: Planning students or consent of instructor |
| PLAN 360 W | 3C | 0.5 |
| **Technology In Urban and Regional Planning** |  | The influence of transportation, communications, and water and sewage systems on the form, function and development of cities and regions; the application of this knowledge in urban and regional planning.  
  Prereq: Environmental Studies students only |
| PLAN 367 W | 3C | 0.5 |
| **Conservation In Wildland and Resource Management** |  | Consideration of the constraints and guidelines that an application of the principles of ecology place on the planning and management of resources within natural and agricultural ecosystems. The theory and history of this subject will be discussed together with the management of wildlife, forestry, fisheries, parks and open space, and agriculture.  
  Prereq: ENV S 2 00  
  Cross-listed as GEOG 367  
  Lab fee $10-15  
  Students may receive credit for only one of PLAN 367 and GEOG 367 |
| PLAN 380 S | 3C | 1.0 |
| **Theory and Practice of Planning in the U.K.** |  | Familiarization with the contribution of U.K. theory and practice to Canadian planning. A study of development of U.K. planning from mid-eighteenth century to present with reference to new town and urban redevelopment.  
  Prereq: Third year planning students or consent of instructor. Students register on a Letter of Permission. Additional course fee. |
| PLAN 390 W,S | 3C | No credit |
| **Senior Honours Essay Proposal** |  | A training course for developing a research proposal for the Senior Honours Essay. Students will develop a research proposal under direction of a faculty member. Types of research which can be employed in the development will be discussed as well as the methods available. Students will present proposals as a mode for evaluating their participation.  
  Prereq: Third year planning students only |
| PLAN 420 W | 2C | 0.5 |
| **Health, Environment, and Planning** |  | A seminar course on the environmental sources and causes of disease and illness, the concepts of health, e.g. medical, scientific, economic, political, etc., the health services and facilities and related technologies and the role and responsibility of (urban and regional) planners in the creation of a more "healthful" environment.  
  Prereq: Third- and fourth-year Planning students or consent of instructor. Estimated additional cost to student: $20 |
| PLAN 435 W | 2C,2std | 0.5 |
| **Site Planning** |  | A design studio workshop involving site planning projects which integrate design and the natural processes of landscape and climate. Topics will vary.  
  Prereq: PLAN 256A/B or consent of instructor. Estimated additional cost to student: $60 |
Plan 454 F 2S 0.5
Professional Practice in Planning
This course is intended for undergraduate planning students in their final year who will be starting professional practice on graduation. The course discusses professional responsibility, administrative tools and methods, office organization and similar topics. Concepts and techniques in other courses will be dealt with from the point of view of the practitioner.
Prereq: Fourth-year planning students or consent of instructor

Plan 456A F,W 3C 0.5
Political and Administrative Processes in Urban and Regional Planning 1
Political and administrative frameworks for planning and the formulation of urban/regional policy in an intergovernmental setting. Study of the process and substance of planning in relation to: politics, administration, policy, decision-making, legislation, plan preparation and implementation in Canada.
Prereq: Fourth-year Planning students or fourth-year Environmental Studies students with consent of instructor

Plan 456B F,W 3C 0.5
Political and Administrative Processes in Urban and Regional Planning 2
Continuation of PLAN 456A.
Prereq: PLAN 456A

Plan 470 W 2S 0.5
International Winter City Development
A multidisciplinary approach which explores and analyzes case studies of human settlements situated in cold-climate regions. The focus is directed toward Canada, USA, Norway, Sweden, Finland and Iceland, although other countries such as Japan, USSR, China may be included.
Prereq: Third- or fourth-year Environmental Studies students only

Plan 475A/B/C F,W,S 3R 0.5 each
Projects, Problems and Readings in Planning
Special planning projects and problems chosen in consultation with instructor.
Prereq: Consent of instructor
A student must arrange with a faculty member to serve as advisor prior to registering for this course.
The letter designation allows this course to be taken more than once for credit.

Plan 480A F,W 3S 0.5
The Philosophy and Methodology of Urban and Regional Planning 1
A seminar course on some current and changing social philosophies, the image of man, the notions of ethics, morality, authority, equity, etc., and the related perceptions and perspectives and conceptions of social and environmental realities and their relevance to planning, its human information base, processes and procedures.
Prereq: Fourth-year Planning students only

Plan 480B F,W 3S 0.5
The Philosophy and Methodology of Urban and Regional Planning 2
Continuation as outlined in Part 1 with the focus on the theories or foundations for the development of an environmental ethic and the implications of the notions discussed in Part 1 as the philosophical base for planning.
Prereq: PLAN 480A

Plan 490A F,W 0.5
Seniors Honours Essay 1
Practical experience in the identification of a problem in the planning field. Conduct of individual research into this problem and presentation of the results in a form that meets both professional and academic standards, as further elaborated in a policy statement available from the undergraduate officer.
Prereq: Fourth-year Planning students only
A letter grade of PLAN 490A will be submitted only after the completion of PLAN 490B.

Plan 490B F,W 1.0
Senior Honours Essay 2
Completion of essay.
Prereq: PLAN 490A

COURSES NOT OFFERED 1991-92
- Plan 230 The Small Group in the Planning Process
- Plan 317 Nonparametric Statistics
- Plan 318 Spatial Analysis
- Plan 319 The Economic and Social Techniques for Regional Planning
- Plan 344 Recreation Planning
- Plan 430 Social Policy Planning
- Plan 434 Planning with Native People

For courses in Polish see Germanic and Slavic Languages and Literatures.

Undergraduate Officer
A.D. Nelson, HH 302, ext. 2823

Courses not offered in the current academic year are listed at the end of this section.

Introductory Note
Extensive descriptions of the content of Political Science courses are available in the Department at the time of preregistration.

PSCI 101A F 0.5
Introduction to Politics 1
An introduction to the nature of politics and to the conflict of political ideas within the setting of a liberal democracy. The purpose is a clearer understanding of conservatism, liberalism and socialism.

PSCI 101B F 0.5
Introduction to Public Policy
This course is an introduction to the process of policy making. Students will be given an opportunity to examine, in the context of several examples, the factors affecting choices among policy alternatives. In addition, questions about the range of alternatives and the implementation of policies will be addressed.

PSCI 102 consists of a series of courses dealing with different aspects of politics. Students should select the course which most closely corresponds to their interest.

First-year winter term courses will be drawn from the following list:

PSCI 102D W 0.5
The Political Process in the Modern Democracies
A study of power and influence in the modern democracies, based on an examination of 3 contending models in the political process - the liberal-democratic or popular rule model, the pluralist model, and the elitist model.
An evaluation of various public policy and political change.

PSCI 102F  W  0.5
Introduction to Third World Politics
An introductory survey of Third World politics and society with an emphasis on Latin America and Africa.

PSCI 102K  W  0.5
Mass Political Violence
A distinctive social feature of our century is the amount of political violence. Man-made deaths number approximately one hundred million. This course will describe and evaluate various theories of political violence.

PSCI 102M  W,S  0.5
Contemporary Issues in Canadian Public Policy
An evaluation of various public policy responses to some contemporary Canadian social, cultural, economic, environmental, and political problems, as well as the process of policy-making.

PSCI 102N  W  0.5
The Politics of Nationalism and Ethnicity
An examination of the roots of nationalism, and the impact of nationalism and ethnicity on the political process and political change.

PSCI 214  2C,1L  0.5
Quantitative Analysis
An introduction to the use of quantitative methods in Political Science. Only a rudimentary understanding of mathematics is required.

PSCI 225  F  2C,1T  0.5
The History of Political Theory 1
A survey of the principal ideas of Western political theorists from the earliest times to the 17th century.

PSCI 226  W  2C,1T  0.5
The History of Political Theory 2
A survey of the principal ideas of Western political theorists since the 17th century.

PSCI 231  F,W  0.5
Government and Business in Canada
An examination of the political environment in which business functions in Canada with particular emphasis on the constraints and opportunities conditioned by government intervention in and interaction with the private sector.

PSCI 256  W  0.5
The Politics of Western Industrial Nations II
This course will examine a number of ways by which developed countries have tried to overcome the contemporary "crisis". Topics to be discussed include economic planning and participation, wage controls, corporatism, decentralization and authoritarianism.

PSCI 260A  F,S  2C,1D  0.5
Canadian Government and Politics 1
An analysis of the political environment in which the Canadian political system operates, including discussion of the Canadian political culture, federalism, the constitution, federal-provincial relations, and the role of the Governor General.

PSCI 260B  W,S  2C,1D  0.5
Canadian Government and Politics 2
An analysis of the decision-making machinery of the Canadian political system, including discussion of cabinet government, the role of the House of Commons, interest groups, the federal-provincial system, the party system and voting behaviour.

PSCI 264  F  0.5
American Government and Politics
The theory and practice of the American political system as revealed by the institutions and operations of American national government.

PSCI 268  W  2C,1T  0.5
British Government and Politics
An examination of the uniquely British characteristics of the British political system.

PSCI 271  F  2C,1L  0.5
Political Behaviour 1
Empirical approaches to the study of politics are examined in light of their assumptions, aspirations, and critiques.

PSCI 277  W  0.5
Political Behaviour 2
An examination of the political attitudes and behaviour of men and women in different political systems.

PSCI 281  F  0.5
International Politics
This course studies the transformation of the international system stressing East-West, Rich-Poor, and North-South perspectives and interactions.

PSCI 282  W  0.5
Foreign Policy
This course studies the roots of foreign policy behaviour of selected western and non-western (particularly Asian) states.

PSCI 281 or consent of instructor

PSCI 291  F,S  3C  0.5
The Canadian Legal Process
An analysis of the manner in which the Common Law functions, together with an examination of the structure and jurisdiction of the Canadian court systems. Taught by a member of the legal profession.

PSCI 292  W,S  3C  0.5
Issues in Criminal Law
Rational principles and concepts applicable to current emotional criminal issues are analyzed by a practising crown attorney, for example, abortion, euthanasia, pornography, seat belts, homosexuality, marijuana, police power, civil rights, criminal trials, jury, capital punishment, prisons, etc.

PSCI 281 or consent of instructor

PSCI 282 or consent of instructor
Applying the knowledge gained in PSCI administration and management Analysis of problems and issues in instructor Public Administration 2

A selective examination of political philosophy during the classical period in Greece. Pre req: Consent of instructor

PSCI 324 F 0.5

Modern Political Philosophy
A selective examination of political philosophy in the modern period. Pre req: Consent of instructor

PSCI 331 F 0.5

Public Administration 1
An introduction to the principles of public administration illustrated by the study of Canadian institutions largely at the federal level, but including provincial and municipal examples. Pre req: PSCI 260A and 260B or consent of instructor

PSCI 332 W, S 0.5

Public Administration 2
Analysis of problems and issues in administration and management applying the knowledge gained in PSCI 331. Pre req: PSCI 331 or consent of instructor

PSCI 333 W 0.5

Administrative Law
A study of Canadian administrative law including the delegation of political power to various administrative agencies which play a prominent role in controlling contemporary social and economic life. The supervisory role of the courts will also be examined. Pre req: PSCI 331 or consent of instructor

PSCI 341 F 0.5

Provincial Politics
A comparative analysis of the political systems of the Canadian provinces. Pre req: PSCI 260

PSCI 342 W 0.5

Politics in Quebec
A seminar dealing with the political and social development of Quebec. The emphasis will be on the problems and issues of contemporary Quebec. Pre req: PSCI 260A and 260B or consent of instructor

PSCI 343 F 0.5

Canadian Municipal Government
A study of the assumptions, structures and performance of municipal government in Canada with reference to metropolitan and regional structural innovations (particularly in Ontario).
Open to students in the third year and above with at least 1 previous course in Political Science.

PSCI 344 W 0.5

The Politics of Local Government
A study of the political process in selected Canadian local governments focusing on citizen participation, internal decision-making, leadership, and the allocation of power. Pre req: PSCI 343 or consent of instructor

PSCI 350B W 0.5

The Politics of the Developing Areas 2
An analysis of Third World political structures and processes. Topics include the colonial and post-colonial state, political parties, the military and revolutions. The case of Central America is examined in greater detail.
No pre req for students in the third year and above.

PSCI 351 F 0.5

Federal and Consociational Political Systems
Federal and Consociational Political Systems are examined with emphasis on processes of political integration, patterns of conflict resolution, and the impact of modernization on political development.
Pre req: Consent of the instructor

PSCI 362A F 0.5

Soviet Government and Politics I
An examination of conceptual frameworks for the study of politics in the Soviet Union, and the environment and institutions of the Soviet political system.
Pre req: Third-year standing or consent of instructor

PSCI 362B W 0.5

Soviet Government and Politics II
This course examines policy-making and implementation in the Soviet Union, and the dynamics of change in the Soviet political system.
Pre req: PSCI 362A or consent of instructor

PSCI 363 F 0.5

Canadian Constitutional Law
An introduction to the nature and basic principles of constitutional law. This course will deal especially with the distribution of powers in the Canadian federation, and its evolution, notably by judicial decision. Leading cases will be examined.
Pre req: PSCI 260A and 260B or 260A and consent of instructor

PSCI 372 W 0.5

Political Parties and Interest Groups
An examination of the roles of interest groups and political parties in influencing government policy. The origins, tactics, structures and impact of these two avenues of political participation will be compared. Discussion will focus on Canadian examples.
Pre req: Third-year standing or consent of instructor
PSCI 375 W 0.5  
The Politics of Self-Management  
An examination of the participation of citizens in decision making, both at work and in politics. The self-management system of Yugoslavia will be studied in detail.  
Prereq: Second year standing or above

PSCI 380A F 0.5  
World Politics 1  
An examination of the structure of the world capitalist system concentrating upon warfare between core states during 1815-1945 and assessing the impact of the nuclear revolution. A number of classic theories of imperialism are considered.  
Open only to students in the third year and above.

PSCI 380B W 0.5  
World Politics 2  
An examination of the allocation of misery in the world capitalist system. The focus is on core/periphery relations and a number of theories of imperialism are considered.  
Prereq: Open only to students in the third year and above.

PSCI 381 W 0.5  
Foreign Policies of South Asian States  
The course (1) defines the central issues in each country's foreign policy; (2) discusses the factors which shape the decision making processes; and (3) evaluates the impact of these policies on regional and international thinking.

PSCI 382 W 0.5  
Politics of Canadian Foreign Policy  
An examination of issues and the foreign policy-making process in Canada. Special attention is paid to the domestic context of foreign policy.

PSCI 390-398 0.5  
Special Studies  
From time to time courses of special study may be added to the program at the third year level. Students wishing to take such courses should consult the Department's Undergraduate Officer.

PSCI 422 0.5  
Conflict of Political Ideas in Canada  
A course designed to introduce students to some of the major ideas about politics and democracy which Canadians have developed in the course of this century. Conservatism, liberalism, socialism, agrarian protest politics, and nationalism will be considered in their historical context. In particular, the course will address the issues of democracy and industrialization in Canada and will examine closely the conflicting liberal, socialist and conservative notions of progress and political community.

PSCI 426 0.5  
Selected Subjects in Political Philosophy  
A selective treatment of basic themes in political philosophy in the modern and pre-modern times.  
Prereq: For third-year Political Science students, but open to others with prereq of PSCI 225, 226, 323, or 324, or consent of instructor

PSCI 427 F 0.5  
Special Topics in Political Philosophy  
A selective examination of basic problems in political philosophy in the modern and pre-modern periods.  
Prereq: PSCI 225, 226, 323, or 324

PSCI 428 F 3S 0.5  
State and Economic Life  
An analytical and comparative study of the growth of government intervention in the economic process, and of the development of the welfare state.  
Prereq: Consent of the instructor

PSCI 431 F 0.5  
Canadian Public Policy  
An examination of the way that policy processes and institutions have responded to the problems of governing, especially at the federal level in Canada.  
Prereq: PSCI 260A, 260B, 331 or consent of instructor

PSCI 433 0.5  
Public Policy and Underdevelopment in the Third World  
An examination of industrial strategies, agricultural programs and energy policies of selected Third World countries focussing upon the political obstacles, both domestic and foreign, to the achievement of the long term integrated planning required for the alleviation of poverty in the Third World.  
Prereq: Fourth-year standing or consent of instructor

PSCI 434 F 0.5  
Comparative Public Administration  
A comparative survey of public administration in both developed and developing areas. The focus is on the rise of the administrative state in a variety of cultural and political contexts.  
Prereq: PSCI 331 or consent of instructor

PSCI 435 W 2S 0.5  
The Politics of Canadian Resource Development  
A seminar focusing on the strategies of resource development policies, with an emphasis on the economic, political, environmental and cultural implications of oil, natural gas, and mineral exploitation.  
Prereq: Fourth-year standing or consent of instructor

PSCI 442 W 3S 0.5  
Politics in Ontario  
A critical examination of the distinctive elements of government and politics in the Province of Ontario  
Prereq: PSCI 260A and 260B or consent of the instructor

PSCI 443 2S 0.5  
Politics in Western Canada  
A critical examination of the distinctive elements of government and politics in the provinces of Manitoba, Saskatchewan, Alberta and British Columbia.  
Prereq: PSCI 260 or consent of instructor

PSCI 451 F 0.5  
Comparative Political Systems: Eastern Europe  
A comparative examination of political institutions and processes in the states of Eastern Europe.  
Prereq: Fourth-year standing or consent of instructor

PSCI 452 F 0.5  
Comparative Civil-Military Relations - Soviet Union and Eastern Europe  
A seminar on the military and politics in the Soviet Union and Eastern Europe since World War II; how the military system affects and, in turn, is affected by the political system and society.  
Prereq: Fourth-year standing or consent of instructor
PSCI 453 F 3S 0.5
Comparative Politics of Latin America
The course examines the politics of Latin America focusing upon the interplay between external ties and internal processes. Topics include comparative studies of class alliances, the establishment of bureaucratic authoritarian regimes and revolutionary movements.

Prereq: Fourth-year standing or consent of instructor

PSCI 454 W 3S 0.5
Rural Politics and Development
An analysis of causes and political implications of rural poverty in the Third World with the focus on alternative strategies of rural development.

Prereq: Fourth-year standing or consent of instructor

PSCI 461 F 2C,1S 0.5
Problems in Canadian Politics 1
Selected aspects of Canadian national politics.

Prereq: Fourth-year standing or consent of instructor

PSCI 462 W 0.5
Problems in Canadian Politics 2
Selected aspects of Canadian provincial politics.

Prereq: Fourth-year standing or consent of instructor

PSCI 471 W 0.5
Public Opinion and Propaganda
A detailed study of the nature of public opinion and the attempt to control it through propaganda.

Prereq: Consent of the instructor

PSCI 473 2S 0.5
Voting Behaviour

Prereq: PSCI 214 or consent of instructor

PSCI 475 F 2S 0.5
Political Socialization
A study of the processes and agents of political socialization and their effects on political stability or change in liberal-democratic societies.

Prereq: Consent of the instructor

PSCI 476 W 0.5
Research Seminar in Political Behaviour
A research-oriented seminar on selected theoretical works in political behaviour, with an emphasis on the development of research projects dealing with Canadian topics.

Prereq: Consent of the instructor

PSCI 479 2S 0.5
Senior Research Seminar: Violence in the Political Process
Politics can be brutal. This seminar deals with violence in the political process. The focus is on the relationship between the society and the coercive apparatus of the state.

Prereq: Third- or fourth-year standing

PSCI 481 2S 0.5
Research Seminar on World Politics
An examination of research on the causes and consequences of interstate warfare.

Prereq: PSCI 380 or consent of instructor

PSCI 483 F 3S 0.5
Power Politics and World Order Studies
This theory course examines the evolution of the international system; the capacity of the system of states to cope with the demands on it; meanings of international and regional power and order.

Prereq: Fourth-year standing or consent of instructor

PSCI 484 W 3S 0.5
Contemporary Strategies: Theories and Policies
The course examines strategic studies and their premises, the evolution of strategic thinking, the role of national policies of military power. Strategic concepts are studied with specific reference to military policies of regional powers.

Prereq: Consent of the instructor

PSCI 485 W 0.5
Selected Topics in International Political Economy
Contemporary perspectives and issues in international political economy, with particular attention to advanced industrial countries. Topics include political-economic cooperation, the politics of trade, and the politics of foreign investment.

PSCI 490-498 0.5 each
Special Subjects
From time to time courses of special study may be added to the program at the fourth year level. Students wishing to add such courses should consult the Department’s Undergraduate Officer.

PSCI 499A/B F,W 0.5/0.5
Special Honours Essay
Students wishing to undertake a senior honours essay in their fourth year should consult the Department’s Undergraduate Officer.

A letter grade for PSCI 499A will be submitted only after the completion of PSCI 499B.

COURSES NOT OFFERED 1991-92
PSCI 102D The Political Process in the Modern Democracies
PSCI 102E Political Rights and Obligations
PSCI 214 Quantitative Analysis
PSCI 271 Political Behaviour 1
PSCI 272 Political Behaviour 2
PSCI 322 Marxism After Marx
PSCI 323 Ancient Political Philosophy
PSCI 375 Politics of Self-Management
PSCI 380B World Politics 2
PSCI 422 Conflict of Political Ideas in Canada
PSCI 433 Public Policy and Underdevelopment in the Third World
PSCI 443 Politics in Western Canada
PSCI 452 Comparative Civil-Military Relations
PSCI 473 Voting Behaviour
PSCI 475 Political Socialization
PSCI 479 Senior Research Seminar: Violence in the Political Process
PSCI 481 Research Seminar on World Politics
Psychology

Undergraduate Office
H. Smith, PAS 4028, ext. 2819

Introductory Note
See departmental course listing catalogue for specific terms of the various course offerings in 1991-92.

PSYCH 101 F,W,S 3C 0.5
Introductory Psychology
A general survey course designed to provide the student with an understanding of the basic concepts and techniques of modern psychology as a behavioural science.

Students may receive credit for only one of PSYCH 101 or PSYCH 120R
Also offered at St. Jerome's College.

PSYCH 102 (A-Z) W 3C 0.5
Introductory Psychology Special Topics
A study in greater depth of selected topics. Previous topics included:
Applied Psychology; Culture's Influence on Behaviour; Psychological Intervention; Social Psychology and Sport.
Topics will be announced each year in time for pre-registration.
Prereq: PSYCH 101
Also offered at St. Jerome's College.

PSYCH 200 3C 0.5
Measurement in Psychology
The logic of measurement in Psychology.
Descriptive procedures for collecting and handling data. Making inferences from test scores. The use of correlational procedures in measuring intelligence, achievement, aptitudes, interests and personality.
Prereq: PSYCH 101
Antireq: Any course in statistics
Enrollment is restricted to Psychology majors and minors and to Arts students whose math background does not exceed one OAC math course (or Grade 12 math plus one term course at the first year level of university math).
Others who wish to enrol in this course require written permission from the Psychology Undergraduate Office prior to registration in the course.

PSYCH 203 F,W 3C 0.5
Learning and Motivation
This course is designed to introduce the student to theories in Learning and Motivation and to provide the student with an understanding of the experimental techniques in these areas.
Prereq: PSYCH 101
Priority enrolment for Psychology majors.

PSYCH 206 3C 0.5
Perceptual Processes
An examination of data and theory concerning perceptual processes.
Topics will include the perception of form and space, perceptual learning and a consideration of the effect of personality variables in perception.
Prereq: PSYCH 101
Priority enrolment for Psychology majors.

PSYCH 207 F,W 3C 0.5
Cognitive Processes
An examination and evaluation of selected topics dealing with human learning, thinking, concept formation, memory and language.
Prereq: PSYCH 101
Priority enrolment for Psychology majors.

PSYCH 208 F,W,S 3C 0.5
Educational Psychology
A consideration of the main variables affecting learning in the classroom with special focus upon the conditions essential to efficient learning.
Prereq: PSYCH 101
Also offered at St. Jerome's College.
Taught in French in the 1992 Spring term.

PSYCH 213 3C 0.5
Exceptional Children
Educational problems associated with mental retardation, emotional disturbances, sensory and physical impairments and intellectual giftedness.
Prereq: PSYCH 101

PSYCH 217 3C 0.5
Aging and Basic Psychological Processes
What processes change as adults age? Is the idea of age-related decline in functioning a myth? The course deals with processes such as memory, perception, intelligence, and problem-solving. It also outlines the problems in interpreting developmental research.
Prereq: PSYCH 101

PSYCH 218 W 3C 0.5
Aging, Dying and Death
An examination of the psychological aspects of aging and the traditional and recent literature relating to various views on the reality of death in human life. Therapy with dying individuals is reviewed and evaluated.
Prereq: PSYCH 101 or permission of the instructor
Offered at St. Jerome's College.

PSYCH 231 3C 0.5
Psychology of Religious Experience
Approaches of traditional psychological theories and especially of a modern psychology of consciousness toward phenomena of religious experience, mysticism and meditation are examined.
The transcendent phenomena are compared with other altered states of consciousness.
Prereq: PSYCH 101

PSYCH 235 3C 0.5
Psychological Perspectives on Gender and Sex
The course focuses on the existence of and bases for sex and gender differences with emphasis on biological, psychological and cultural issues.
Prereq: PSYCH 101 (PSYCH 211 is recommended)

PSYCH 236 F 3C 0.5
A Psychological Analysis of Human Sexuality.
The course will examine psychological and social psychological theories and empirical investigations of human sexuality.
Prereq: PSYCH 101 or permission of instructor
Antireq: SMF 201A
Offered at St. Jerome's College.

Course Descriptions
Psychology
PSYCH 253  F,W  3C  0.5
Social Psychology
An introduction to the scientific study of social behaviour and social influences on behaviour. Theories and research on such topics as attitude change and persuasion, stereotypes and prejudice, conformity and obedience to authority, altruism, conflict, attraction and love will be introduced.

Students may receive credit for only one of PSYCH 253 or PSYCH 220R.
Prereq: PSYCH 101
Priority enrolment for Psychology majors.
Cross-listed as PSYCH 220R
Also offered at St. Jerome's College.

PSYCH 254  3C  0.5
Interpersonal Relations
A psychological analysis of social interaction. The development of interpersonal attraction from first impressions to long-term relationships. The roots of hostility, conflict and communication problems.

Students may receive credit for only one of PSYCH 254 or PSYCH 221R.
Prereq: PSYCH 253
Cross-listed as PSYCH 221R

PSYCH 261  3C  0.5
Physiological Psychology
Introduction to brain, basic physiological processes, and their roles in behaviour. Course covers sensory and perceptual, neural bases of action, motivation; learning and memory; and consciousness. Both experimental and clinical data are considered.

Prereq: PSYCH 101 or permission of instructor
Priority enrolment for Psychology majors.

PSYCH 271  3C  0.5
Animal Behaviour
Survey of mechanisms, development, adaptive value and evaluation of behaviour in non-human animals. Covers ethology, sociobiology and experimental comparative psychology. Emphasis on principles of research with laboratory and wild animals as well as methods of observing behaviour.

Prereq: PSYCH 101 or permission of instructor
Priority enrolment for Psychology majors.

PSYCH 291  F  3C,2L  0.5
Basic Research Methods
An introduction to the methods used in psychological research. Methods for observing behaviour and the procedures used to summarize these observations are emphasized.

Prereq: PSYCH 101 and second year Honours standing in Psychology
See overlapping content note
(Grading Systems, Item 7, on p. 8.7)

PSYCH 292  W  3C,1L  0.5
Basic Data Analysis
An introduction to the logic and methods of inferential statistics with emphasis on application in Psychology. Also included is a more detailed treatment of the methods and projects introduced in PSYCH 291.

Prereq: PSYCH 291 and second year Honours standing in Psychology
See overlapping content note
(Grading Systems, Item 7, on p. 8.7)

PSYCH 305  3C  0.5
Sensory Processes
A consideration of data and theory concerning sensory processes. Topics will include psychophysical methodology, sensory mechanisms, and the neuropsychological basis of perceptions.

Prereq: PSYCH 206

PSYCH 307  3C  0.5
Human Cognitive Neuropsychology
An introduction to current human experimental neuropsychology. The course will review evidence for brain-behaviour interactions obtained from studies of human brain damage and from investigations of the normal brain. Topics such as the representation of language, hemispheric specialization, memory, spatial ability, dyslexia, movement disorders and affective disorders will be considered.

Prereq: One of PSYCH 206, 207, 261, or KIN 356

PSYCH 310  3C  0.5
Social Development
This course will be concerned with contemporary issues in psychological study of social development. The course will be organized around a few central issues such as those of continuities and discontinuities of development and the relations between social and cognitive development.

Prereq: PSYCH 211

PSYCH 311  3C  0.5
Behaviour and Development of Human Infants
The purposes of this course are to study the behaviour and development of human infants, to gain direct experience with infants, and to examine community attitudes and resources available for infant care.

Prereq: PSYCH 211 or permission of instructor

PSYCH 312  F,W  3C  0.5
Learning Disabilities
A critical examination of the concept of learning disability and of current issues in the assessment and remediation of learning problems.

Prereq: PSYCH 211, 212, or 213
Students may receive credit for only one of PSYCH 160 or PSYCH 312
Also offered at St. Jerome's College.

PSYCH 314  3C  0.5
Cognitive Development
A consideration of psychological research and theory concerned with the origins and development of cognition in humans. Traces the development of such cognitive skills as problem solving, memory, concept formation, language, and other symbolic capacities from birth to adulthood. Cultural influences on cognitive development will also be considered.

Prereq: PSYCH 207 or 211

PSYCH 315  W  3C  0.5
Psychology of Adolescence
A study of the psychological processes in the second decade of human development. Consideration is given to such areas as intellectual, emotional and social growth, and identity formation. Current concepts, issues, and research are stressed.

Prereq: PSYCH 211
Formerly PSYCH 214
Also offered at St. Jerome's College.

PSYCH 317 F,W  3C  0.5
The Emotionally Disturbed Child
An examination of children's psychological disorders from several major perspectives with an emphasis on current research findings. Theoretical and clinical issues are considered.

Prereq: PSYCH 211
Offered at St. Jerome's College.
An introduction to the methods, theories and problems in individual Counselling Psychology

Theories of Individual Counselling

An introduction to theories and issues in early childhood education. Topics include issues differentiating preschool programs and application of psychological theory/research to education.

Prereq: PSYCH 211

PSYCH 354  3C  0.5
Theories of Group Counselling

Contemporary theories on the therapeutic application of group processes. Issues such as group development, leader skills and training, selection of members, problems encountered in both process and outcome research will be examined.

Prereq: PSYCH 101

Offered at St. Jerome's College.

PSYCH 355  3C  0.5
Personality Theory

An examination and evaluation of some of the outstanding theories of personality.

Prereq: PSYCH 101

Psychopathology

The nature and origin of deviant behaviour.

Prereq: PSYCH 355 or PSYCH 323R

Honours standing in Psychology

Consult departmental listings for Psychology Honours Program.

Prereq: PSYCH 253

Special Topics in Advanced Physiological Psychology

This course continues and extends PSYCH 261. Departmental listings of topics should be consulted.

Prereq: PSYCH 261 or permission of the instructor

PSYCH 363 (A-Z) - 366 (A-Z)  3C  0.5
Special Subjects

These courses will be offered at different times as announced by the Department.

Consult departmental listings for topics and prerequisites.

PSYCH 334  F,W,S  3C  0.5
Theories of Individual Counselling Psychology

An introduction to the methods, theories and problems in individual Counselling Psychology.

Prereq: PSYCH 101

Also offered at Renison College and St. Jerome's College.

PSYCH 335  3C  0.5
Personality and Behaviour Change

Forms of psychological intervention that produce important changes in the way people think, feel and behave including psychoanalysis, behaviour therapy, brainwashing, cult conversions, deprogramming, hypnosis, biofeedback and meditation.

Prereq: PSYCH 101

PSYCH 338  3C  0.5
Organizational Psychology

Survey of organizational, group and individual processes involved in work motivation, group dynamics, leadership, organizational climate and organizational culture.

Prereq: PSYCH 101

Antireq: M SCI 211

PSYCH 339  3C  0.5
Personnel Psychology

An examination of the following major topics in personnel psychology: employment planning, selection and recruitment, selection techniques, career development, performance appraisal, training programs, labour relations, compensation systems.

Prereq: PSYCH 101

PSYCH 340  3C  0.5
Community Psychology

Theory and practice are integrated in an attempt to identify and to understand the social factors which inhibit or facilitate healthy development of the individual. The adequacy of existing social structures and institutions in the treatment of various personal problems is assessed.

Prereq: PSYCH 253

Offered at St. Jerome's College.

PSYCH 341  3C  0.5
Psychology of Early Childhood Education

An introduction to theories and issues in early childhood education. Topics include issues differentiating preschool programs and application of psychological theory/research to early education.

Prereq: PSYCH 211

PSYCH 344  W  3C  0.5
Theories of Group Counselling

An introduction to theories and issues in group development, leader skills and training, selection of members, problems encountered in both process and outcome research will be examined.

Prereq: PSYCH 101

Offered at St. Jerome's College.

PSYCH 354  3C  0.5
Interpersonal Processes in Critical Situations

The course will examine reactions to victims of mistortunes such as serious physical and mental illness, natural disaster, poverty and discrimination.

Prereq: PSYCH 253

PSYCH 355  F,W  3C  0.5
Personality Theory

An examination and evaluation of some of the outstanding theories of personality.

Students may receive credit for only one of PSYCH 355 or PSYCH 322R

Prereq: PSYCH 101

Priority enrolment for Psychology majors.

Cross-listed as PSYCH 322R

PSYCH 357  F,W  3C  0.5
Psychopathology

The nature and origin of deviant behaviour.

Students may receive credit for only one of PSYCH 357 or PSYCH 323R

Prereq: PSYCH 101

Priority enrolment for Psychology majors.

Cross-listed as PSYCH 323R

Also offered at St. Jerome's College.

PSYCH 361 (A-Z)  3C  0.5
Special Topics in Advanced Physiological Psychology

This course continues and extends PSYCH 261. Departmental listings of topics should be consulted.

Prereq: PSYCH 253 or permission of the instructor

PSYCH 363 (A-Z) - 366 (A-Z)  3C  0.5
Special Subjects

These courses will be offered at different times as announced by the Department.

Consult departmental listings for topics and prerequisites.

PSYCH 391  F  3C,1L  0.5
Advanced Data Analysis

An examination of the effective use and interpretation of statistics in complex research designs. Topics include an introduction to multivariate analysis, analysis of variance, and applied psychological research.

Prereq: PSYCH 292 and third year Honours standing in Psychology

See overlapping content note (Grading Systems, item 7 on p. 8.7)

PSYCH 392  W,S  2S,2L  0.5
Psychological Measurement

An introduction to the logic of measurement in Psychology with special emphasis placed on the use of psychological tests to assess individual and group differences.

Prereq: PSYCH 391 and Honours standing in Psychology

PSYCH 393  2S,2L  0.5
Research In Developmental Psychology

Open only to students in a Psychology Honours Program.

Prereq: PSYCH 211 and 391 (acceptable as a corequisite)

PSYCH 394  2S,2L  0.5
Research In Perceptual and Cognitive Processes

Open only to students in a Psychology Honours Program.

Prereq: PSYCH 206 or 207 and 391 (acceptable as a corequisite)

PSYCH 395  2S,2L  0.5
Research In Social Psychology

Open only to students in a Psychology Honours Program.

Prereq: PSYCH 253 and 391 (acceptable as a corequisite)

PSYCH 396  2S,2L  0.5
Research In Biopsychology

Open only to students in a Psychology Honours Program.

Prereq: PSYCH 261 and 391 (acceptable as a corequisite)

PSYCH 397  2S,2L  0.5
Research In Personality and Psychopathology

Open only to students in a Psychology Honours Program.

Prereq: PSYCH 355 or 357 and 391 (acceptable as a corequisite)

PSYCH 398  2S,2L  0.5
Research In Learning and Motivation

Open only to students in a Psychology Honours Program.

Prereq: PSYCH 203 or 271 and 391 (acceptable as a corequisite)
PSYCH 440A/B  F,W  3C,3C  0.5/0.5

**Group and Individual Counselling**  
The practice of counselling in terms of current psychological theories and research. The demonstration and development of these concepts are aided by personal participation, exercises, role play and videotape simulation.  
**Prereq:** PSYCH 334 and 344 or suitable alternative and permission of instructor  
Offered at St. Jerome’s College.  
A grade for PSYCH 440A will be submitted only after the completion of PSYCH 440B.

PSYCH 480 (A-Z)  F,W,S  1S.3L  0.5

**Directed Studies in Special Topics**  
This is an opportunity for independent experimental research or extensive reading. Before a student can register for this course, a proposal outlining the course, e.g. area of study, method of evaluation, etc., as agreed to by both the student and the professor, must be filed with the undergraduate secretary. A maximum of one term course in directed studies may be used toward the five Psychology electives required for the General Program and a maximum of two term courses towards the Psychology electives required in the Honours Program. A 480 project may be used to fulfill either an Honours Seminar or an Advanced Psychology requirement in the Honours Program.

**Prereq:** Open to third and fourth year Psychology students who have a cumulative Psychology average of 75% or better

PSYCH 499A/B/C  F,W,S  0.5/0.5/0.5

**Honours Thesis**  
Each student will work under the direction of a member of the department on a Research Project. The project will involve an empirical study and/or a critical integrative review of some issue or issues in the research literature of Psychology. The result of this investigation will be presented by the student in the form of a thesis which will be examined critically by members of the department. Although a thesis supervisor normally comes from within the Psychology Department, approval for other thesis supervisors may be sought from the course co-ordinator. Students may choose to begin 499 in their 3B or 4A term.

Open to Honours Psychology or Make-Up Psychology students only  
A letter grade for PSYCH 499A and PSYCH 499B will be submitted only after the completion of PSYCH 499C.

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**HONOURS SEMINARS**  
Consult departmental listings for topics and pre-requisites for 1991-92. Open to third and fourth year Honours Psychology or Make-Up Psychology students, or by consent of the instructor.

PSYCH 450 (A-Z)  2S  0.5  
Honours Seminar In the History of Psychology

PSYCH 451 (A-Z)  2S  0.5  
Honours Seminar In Learning

PSYCH 452 (A-Z)  2S  0.5  
Honours Seminar In Perception

PSYCH 453 (A-Z)  2S  0.5  
Honours Seminar In Developmental Psychology

PSYCH 454 (A-Z)  2S  0.5  
Honours Seminar In Educational Psychology

PSYCH 455 (A-Z)  2S  0.5  
Honours Seminar In Social Psychology

PSYCH 456 (A-Z)  2S  0.5  
Honours Seminar In Personality

PSYCH 457 (A-Z)  2S  0.5  
Honours Seminar In Clinical Psychology

PSYCH 458 (A-Z)  2S  0.5  
Honours Seminar In Cognitive Processes

PSYCH 459 (A-Z)  2S  0.5  
Honours Seminar In Motivation

PSYCH 461 (A-Z)  2S  0.5  
Honours Seminar In Physiological Psychology

PSYCH 463 (A-Z) / 466 (A-Z)  2S  0.5  
Honours Seminar In Special Topics

**The following courses are administered by Renison College. Since these courses are intended primarily for students in the Social Development Studies program, students planning a General or Honours Psychology program must consult their faculty advisor concerning Psychology major credit for these courses.**

PSYCH 120R  F  3C  0.5  
Introductory Psychology

PSYCH 121R  W  3C  0.5  
Introductory Psychology (Special Topics)

PSYCH 220R  F  3C  0.5  
Social Psychology  
Cross-listed as PSYCH 253

PSYCH 221R  W  3C  0.5  
Interpersonal Interaction  
Cross-listed as PSYCH 254

PSYCH 322R  F  3C  0.5  
Personality Theory  
Cross-listed as PSYCH 355

PSYCH 323R  W  3C  0.5  
Abnormal Psychology  
Cross-listed as PSYCH 357

PSYCH 367R-369R  
Special Topics In Psychology

PSYCH 369R  W  3C  0.5  
Advanced Topics In Counselling Psychology

PSYCH 398R/399R  S,F,W  R  0.5  
Independent Study  
Open to senior Social Development Studies majors only.

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**Pure Mathematics**

**Undergraduate Officer**
L.J. Dickey, MC 5078, ext. 4076

**Introductory Note**
More detailed course descriptions and availability information may be obtained upon request from the Pure Mathematics Department.

PMATH 330  F,W,S  3C  0.5  
Introduction to Mathematical Logic 1  
This course will be of interest to all math students.
Course Descriptions

PMATH 331 F,W 3C 0.5
Real Analysis
Topology of $\mathbb{R}^n$, continuity, norms, metrics, completeness, Fourier series, and applications, for example, to ordinary differential equations, the heat problem, optimal approximation, the isoperimetric inequality.
Prereq: MATH 230B or 237
Antireq: MATH 322A, PMATH 351
Cross-listed as AM 331
For students in programs outside of Pure Mathematics.
Not available for credit to students in Honours Pure Mathematics programs.

PMATH 332 W,S 3C 0.5
Complex Analysis
Complex numbers; continuity, differentiability, analyticity of functions; the Cauchy-Riemann equations; solution of Laplace's equation; conformal mapping by elementary functions, and applications; contour integration, the Cauchy and allied theorems; Taylor and Laurent expansions, uniform convergence and power series; the residue calculus, and applications.
Prereq: MATH 230B or 237
Antireq: MATH 322B, 322B, PMATH 352
Cross-listed as AM 332
Formerly MATH 322B
Not available for credit to students in Honours Pure Mathematics programs.

PMATH 334 F,W,S 3C 0.5
Introduction to Rings and Fields
Rings, ideals, factor rings, homomorphisms, finite and infinite fields, polynomials and roots, field extensions, algebraic numbers, and applications, for example, to Latin squares, finite geometries, geometrical constructions, error-correcting codes.
Prereq: MATH 134A, 234A or MATH 135, 235
Antireq: MATH 324, PMATH 344
For students in programs outside of Pure Mathematics.
Not available for credit to students in Honours Pure Mathematics programs.

PMATH 336 F,W 3C 0.5
Introduction to Group Theory
Groups, subgroups, normal subgroups, quotient groups, morphisms. Products of groups. Permutation groups. Symmetry groups.
Prereq: MATH 125, 225
Antireq: MATH 224B, 234B, 244B, PMATH 343
Formerly MATH 234B

PMATH 340 W 3C 0.5
Elementary Number Theory
An elementary approach to the theory of numbers; the Euclidean algorithm, congruence equations, multiplicative functions, solutions to Diophantine equations, continued fractions, and rational approximations to real numbers.
Prereq: MATH 224B or 225
Antireq: PMATH 440
This course will be of interest to all math students.

PMATH 343 F,W 3C 0.5
Abstract Algebra 1
Introduction to group theory, permutations, homomorphisms, subgroups, and normal subgroups, factor groups, Lagrange's theorem, finite Abelian groups. Rings, ideals, modules, domains, Principal Ideal Domains, Euclidean algorithms, Unique Factorization Domains, finitely generated modules over Principal Ideal Domains, applications to finite Abelian groups and Jordan canonical form.
Prereq: MATH 235
Antireq: MATH 224B, PMATH 336
PMATH 343 may be substituted for PMATH 336 whenever the latter is a requirement in an Honours program.

PMATH 344 F,S 3C 0.5
Abstract Algebra 2
Field theory, examples of fields, field of fractions, algebraic extensions, construction of roots, separable extensions, splitting fields, classification of finite fields. Finite non-Abelian groups, Sylow theorems. Introduction to Galois theory.
Prereq: PMATH 343 or PMATH 336 with consent of instructor
Antireq: MATH 324, PMATH 334
PMATH 344 may be substituted for PMATH 334 whenever the latter is a requirement in an Honours program.

PMATH 345 F,G 3C 0.5
Analytic Functions
Cauchy's theorem, Laurent series, the residue theorem, integral evaluation, Möbius and other conformal maps.
Prereq: MATH 230B or 237, or consent of instructor
Antireq: PMATH 332, MATH 322B, 322B
PMATH 352 may be substituted for AM/PMATH 332 or MATH 322B whenever these are requirements in an Honours program.

PMATH 353 W 3C 0.5
Fourier Analysis
Applications of PMATH 351 concepts to Fourier series, differential equations and other topics.
Prereq: PMATH 351
Formerly PMATH 351B

PMATH 354 W 3C 0.5
Elementary Differential Geometry
Curves in Euclidean 3-space ($E^3$) and the Serret-Frenet formulae; surfaces in $E^3$ and their intrinsic geometry. Gaussian curvature and the Gauss-Bonnet theorem. Coordinate transformations and tensors in n-dimensions; n-dimensional Riemannian spaces, covariant differentiation, geodesics, the curvature, Ricci and Einstein tensors. Applications of tensors in Relativity and Continuum Mechanics.
Prereq: AM 241 or MATH 230B, or consent of instructor
Cross-listed as AM 333

PMATH 357 W 3C 0.5
Set Theory and General Topology
Intuitive set theory, metric spaces, point set topology.
Prereq: MATH 230A or 237
PMATH 380A F,S 3C 0.5
Introduction to Information Theory

PMATH 380B W 3C 0.5
Applications of Information Theory
PMATH 380B W 3C 0.5
Applications of Information Theory
Applications of Information Theory
PMATH 380B W 3C 0.5
Applications of Information Theory
PMATH 380B W 3C 0.5
Applications of Information Theory
PMATH 380B W 3C 0.5
Applications of Information Theory
PMATH 380B W 3C 0.5
Applications of Information Theory

PMATH 380C F 3C 0.5
Commutative Algebra
Prime ideals, Krull dimension, integral elements, localization, discrete valuations, Dedekind domains, Noetherian domains. Algebraic and transcendental field extensions, algebraic closure, introduction to algebraic geometry. Prereq: PMATH 344

PMATH 432 F 3C 0.5
Mathematical Logic
First order languages and theories.

PMATH 440 W 3C 0.5
Analytic Number Theory
An introduction to elementary and analytic number theory: primitive roots. law of quadratic reciprocity, Gaussian sums, Riemann zeta-function, distribution of prime numbers. Prereq: AM/PMA TH 332 or MATH 332B or PMATH 352

Prereq: PMATH 352 or AM/PMA TH 332 or MATH 332B

PMATH 441 W 3C 0.5
Algebraic Number Theory
An introduction to algebraic number theory; unique factorization, Dedekind domains, class number of, Dirichlet's unit theorem, solutions of Diophantine equations, Fermat's 'last theorem'. Prereq: PMATH 334 or 344

PMATH 442 F 3C 0.5
Multilinear Algebra
Continuation of linear algebra. Main topics: representations of endomorphisms, structure of bilinear forms, multilinear products. Prereq: MATH 234A or 235

PMATH 443 3C 0.5
Multilinear Algebra
Continuation of linear algebra. Main topics: representations of endomorphisms, structure of bilinear forms, multilinear products. Prereq: MATH 234A or 235

PMATH 444 F 3C 0.5
Non-Commutative Algebra

Next offered in Fall 1991.

PMATH 445 W 3C 0.5
Ring Theory
Continuation of the theory of rings and modules.

Prereq: PMATH 334 or 344

PMATH 446 F 3C 0.5
Group Theory
Permutations, Cayley Theorem, Sylow Theorem, Jordan-Hölder Theorem, nilpotent and solvable groups, direct and semidirect products, free groups. Prereq: PMATH 334 or 344

PMATH 447 F 3C 0.5
Commutative Algebra
Prime ideals, Krull dimension, integral elements, localization, discrete valuations, Dedekind domains, Noetherian domains. Algebraic and transcendental field extensions, algebraic closure, introduction to algebraic geometry. Prereq: PMATH 344

PMATH 448 F 3C 0.5
Commutative Algebra
Prime ideals, Krull dimension, integral elements, localization, discrete valuations, Dedekind domains, Noetherian domains. Algebraic and transcendental field extensions, algebraic closure, introduction to algebraic geometry. Prereq: PMATH 344

PMATH 449 F 3C 0.5
Measure and Integration
Lebesgue measure and integral for the real line, general measure and integration theory, convergence theorems, Fubini's theorem, absolute continuity, Radon Nikodym theorem, L^p-spaces. Prereq: AM/PMA TH 331 or PMATH 351

Cross-listed as AM 431

PMATH 450 W 3C 0.5
Topics in Complex Analysis
The Riemann mapping theorem and several topics such as analytic continuation, harmonic functions, elliptic functions, entire functions, univalent functions, special functions. Prereq: PMATH 352

PMATH 451 F 3C 0.5
Measure and Integration
Lebesgue measure and integral for the real line, general measure and integration theory, convergence theorems, Fubini's theorem, absolute continuity, Radon Nikodym theorem, L^p-spaces. Prereq: AM/PMA TH 331 or PMATH 351

Cross-listed as AM 431

PMATH 452 W 3C 0.5
Topics in Complex Analysis
The Riemann mapping theorem and several topics such as analytic continuation, harmonic functions, elliptic functions, entire functions, univalent functions, special functions. Prereq: PMATH 352

PMATH 453 W 3C 0.5
Functional Analysis
Banach spaces, linear operators, geometry of Hilbert spaces, Hahn-Banach theorem, open mapping theorem, compact operators, applications. Prereq: PMATH 353 or AM 431/PMATH 451

Cross-listed as AM 432

PMATH 454 3C 0.5
Differential Manifolds
Topics chosen from: Charts and atlases, Manifolds and Diffeomorphisms, Tangent Spaces, Submanifolds, Vector Bundles, Tensor and Exterior Algebras, Differential Forms, Oriented Manifolds and Geometry, Homogeneous Spaces and Lie Groups. Prereq: PMATH 365 or consent of instructor

PMATH 455 F,S 3C 0.5
Differential Geometry
Some global aspects of surface theory, the Fuller-Poincaré characteristic, the global interpretation of Gaussian curvature via the Gauss-Bonnet formula. Submanifolds of R^n, induced Riemannian metrics, extrinsic and intrinsic curvatures, Gauss-Codazzi equations. Local Lie groups of transformations on R^n, infinitesimal generators, the Lie derivative. An introduction to differentiable manifolds, the tangent and cotangent bundles, affine connections and the Riemann curvature tensor. The above topics will be illustrated by applications to continuum mechanics and mathematical physics. Prereq: AM 333/PMATH 365 or consent of instructor Cross-listed as AM 433

PMATH 467 3C 0.5
Topology
Topics from algebraic, combinatorial and geometric topology. Prereq: MATH 234B or PMATH 336, PMATH 367

PMATH 470 3C 0.5
Functional Equations
Cauchy's, Pexider's, and similar equations. Equations for polynomials and trigonometric functions. Reduction to different equations. Applications. Prereq: Consent of Instructor

PMATH 499
Readings in Pure Mathematics
Recreation and Leisure Studies

Course Descriptions
Recreation and Leisure Studies

REG 100 F 3C 0.5
Introduction to the Study of Leisure and Recreation and Leisure Services
An overview of the broad field of recreation and leisure services emphasizing the understanding of various leisure phenomena. As such, it provides the student with an introductory understanding of the nature and scope of leisure, leisure behaviour, affiliated recreation activity, and the array of resources associated with each.

REG 200 3C 0.5
Theories of Play
A critical analysis of definitions, concepts and assumptions of classical, recent and modern theories of play with implications for research strategies, programming and planning for play.
Prereq: PSYCH 101

REG 201 W,S 3C 0.5
Sociology of Leisure
Nature and extent of leisure phenomena in contemporary society. Examination of institutional and formal organizational aspects, social role, social research strategies employed in the study of leisure.
Prereq: SOC 101
Cross-listed as SOC 347

REG 204 3C 0.5
Leisure and Recreation in Historical Perspective
Analysis of socio-cultural determinants which have influenced Canadian Leisure behaviour.
Prereq: REC 100 or consent of instructor

REG 205 F.S 3C,1L 0.5
Social Psychology of Leisure
A study of the effects of personality and social factors in shaping how people perceive, experience and respond to discretionary time. Current theory and research focusing on the impact of leisure on the socio-psychological adjustment of the individual, and applications to human problems associated with leisure will be examined.
Prereq: PSYCH 101

REG 209 F.S 2C,1L 0.5
Computer Applications in Leisure Services
Theory and application in leisure service management and programming. Examination of computer impact on leisure service industry.
Prereq: CS 100 or consent of instructor

REG 210 F 3C 0.5
Introduction to Leisure Service Management
Using a wide variety of leisure service agencies as examples, this course focuses on the management functions of planning, organizing, influencing and controlling. Topics include marketing, budgeting, leadership, staffing, goal setting, motivation, communication and problem solving.

REG 220 F,W 3C 0.5
Program Management and Evaluation
The scope of recreation program planning, design, implementation and evaluation is examined along with current associated issues and trends. Emphasis is placed on the planning and evaluation processes and their existence as core elements in any recreation and leisure services organization.
Prereq: REC 100, REC 210 and second-year standing

REG 230 W 3C 0.5
Outdoor Recreation Resources Management
A study of major facets of outdoor recreation programs and facilities from a variety of approaches; history, values, attitudes, economics, ecology, law, policy planning and trends. The emphasis is on providing a knowledge base for decision making by managers. It includes the role of selected governmental, voluntary and private sectors bodies.

REG 231 C 0.5
Recreation and Disability
This course is designed to explore the etiology and issues relevant to the broad spectrum of people who are challenged or disabled. Study will focus on physical, intellectual and emotional or behavioural disabilities.
Prereq: REG 250

REG 251 3C 0.5
Leisure Education — Concepts and Practices
This course covers concepts, theories, and practices of leisure education. Various models, assessment tools, and intervention strategies of leisure education are discussed. Also, settings for leisure education are examined including: school-based programs, job-related programs, Institutional programs and transitional programs.
Prereq: REG 250, 220

REG 255 3C 0.5
Research Design Applicable to Leisure Studies
An introduction to the methods and techniques of research as applied to leisure studies and services. General consideration will be given to the technical problems involved in various stages of research methodology with emphasis on the logic underlying the research process.
Prereq: Second-year standing

REG 270 F 3C 0.5
Travel and Tourism
The scope and nature of travel and tourism as contemporary leisure experiences is examined along with economic, political and social ramifications, research strategies employed and implications for the future.

REG 300 3C 0.5
Philosophy of Leisure
Examination of major philosophical thought through the ages with reference to contemporary viability and effect upon social behaviour.
Prereq: Third-year standing or consent of instructor

Undergraduate Officer
A. Gilbert, BMH 2212, ext. 3015
REC 304 3C 0.5
Community and Cultural Development
Examination of the interrelationships between leisure service delivery systems and community organization theory with respect to local development, social planning and social action. Models of citizen representation and participation in decision-making are taken into consideration relative to the role of the citizen in recreation systems. Students will examine models and action plans for social change focusing on interaction and power relationships between citizen groups and public recreation systems. Special emphasis is placed on culture and the arts as they exist in the community.
Prereq: Third-year standing or consent of instructor

REC 310 3C 0.5
Commercial Recreation Business Development
Students will develop an idea for a small recreation business and will then determine whether or not the idea is feasible. The course emphasizes marketing research, organizational structure, short and long range planning, financial analysis and promotions.
Prereq: REC 210, BUS 121 and third- or fourth-year standing

REC 321-329 0.5
Selected Topics in Recreation and Leisure Studies

REC 331 2C,1L 0.5
Outdoor Education
The present status of outdoor education in modern societal government functions and policies related to outdoor education services; the planning and administration of outdoor education activities are discussed.
Prereq: REC 230

REC 332 2C,2L 0.5
Applied Methods in Outdoor Recreation
Emphasis on methods and techniques used for problem solving and recreation planning and management. Diverse natural settings and environments will be used as the source of data collection and analysis.
Prereq: REC 230

REC 333 3C 0.5
Recreation Geography
The environmental implications of existing and potential recreational demands. Recreation travel, site capability, economic and ecological impact models will be considered as well as the behavioural aspects of amenity resources.
Prereq: REC 230
Cross-listed as GEOG 333

REC 334 3C,1L 0.5
Park Management
Basic administrative procedures in park management. Operational techniques are examined together with general policies of acquisition, operation and development.
Prereq: REC 230, REC 332 or equivalent
Cross-listed as ENV S 334

REC 335 2C 0.5
Issues and Problems in Therapeutic Recreation
This course is designed to explore and examine problems and issues associated with the delivery of therapeutic recreation services. Current issues and trends with regard to professionalization of therapeutic recreation, service delivery models, and administration of services will be covered.
Prereq: REC 251 and REC 350 or consent of instructor

REC 356 3C 0.5
Recreation and Social Action
This course covers concepts, theories and the practice of social change in relation to leisure and recreation behavior and services. Various issues such as poverty, ethnicity, and disability will be addressed. Major areas of discussion will include organizational sources of community and individual effort, leadership, participation, stresses, strains and strategies of social action.
Prereq: REC 250

REC 357 W 3C 0.5
Statistical Techniques Applied to Leisure Studies
An introduction to descriptive and inferential statistics and the interpretation of data. A major consideration of the course is the use of statistics in the solution of problems in recreation and leisure.
Prereq: REC 270 and third-year standing

REC 361 3C 0.5
Aging and Leisure
This course familiarizes the student with the characteristics of the aging population as related to recreation, leisure and lifestyle. Focus is on the understanding and attainment of administrative, management and leadership skills and techniques necessary in the assumption of the direction of programs of recreation, leisure and cultural services of all kinds. Specific emphasis is placed on public sector community services and resources.
Prereq: Third-year standing or consent of instructor

REC 370 0.5
Directed Study in Special Topics
For the student who desires to pursue a particular topic in depth through guided independent readings. A faculty member must approve a student's project prior to registration. Students may take only two directed studies courses for undergraduate degree. See REC 475.
Prereq: Faculty approval

REC 371 W 3C 0.5
Directed Study in Special Topics
An introduction to descriptive and inferential statistics and the interpretation of data. A major consideration of the course is the use of statistics in the solution of problems in recreation and leisure.
Prereq: REC 270 and third-year standing

REC 380 3C 0.5
Recreation and Tourism Analysis
The course introduces the student to a variety of quantitative techniques used in the analysis of recreation and tourism, especially in the context of policy analysis, planning, and marketing. Techniques relevant to both (1) the perceptions and behaviour of recreationists and tourists and (2) the distribution of resources are examined. Specific topics may vary from term to term, but generally include operational definitions, measurement errors, scale developments, simple decision-making models, market segmentation, geostatistics and other regional-descriptive methods, and basic forecasting techniques.
Prereq: REC 371
REC 383 3C 0.5
Perspectives on International Tourism
The character, problems of and prospects for tourism are examined through consideration of tourism in a variety of countries and regions, both developed and developing. Topics include the nature and significance of tourism; economic, environmental and social impacts of tourism; and costs and benefits of tourism to destination areas.
Prereq: GEOG 202, REC 230 or consent of instructor
Cross-listed as GEOG 323

REC 401 3C 0.5
The Economics of Recreation
This course provides the student with a chance to critically examine the application of basic micro-economic concepts to the study of recreation. Special attention is given to demand analysis and its use in non-market valuation problems. Price and income elasticity, the travel cost method, the contingent valuation method, and benefit-cost analysis are also examined. Course content emphasizes public sector issues and equity concerns more than private sector issues.
Prereq: ECON 101 and third-year standing or consent of instructor

REC 402 3C 0.5
Colloquium on Religion and Leisure
Theological notions as they relate to theories of leisure. Contemporary trends and behaviour which affect organized religion their subsequent attitudes toward leisure.

REC 406A/B 1.0
Comparative Recreational Systems
A study of multi-national recreation systems. Course meets on campus and in the field in other countries. Full term study over a period of 6-8 weeks. Laboratory fee varies with field observation.

REC 409 3C,1L 0.5
Computerized Database Applications in Leisure and Cultural Agency Management
Analysis of information handling tasks. Theory and design of database applications. Students are required to design and produce an operational application.
Prereq: CS 100 and REC 209 or equivalent and third- or fourth-year standing

REC 410 3C 0.5
Planning of Recreation Facilities
A course to introduce the students to the planning, design and management of recreation areas and facilities.
Prereq: REC 332 or equivalent or consent of instructor, fourth-year standing

REC 413 3C 0.5
Advanced Seminar in Leisure Service Management
This course is designed to allow students to combine their business/public administration courses, job experiences and leisure service management issues in a small group setting. Managerial problems are identified and alternative solutions are generated by examining the problems from both a research perspective and a practitioner's perspective.
Prereq: Fourth-year standing, Business Option or Public Administration Option or Joint Honours Political Science and Recreation

REC 416 3C 0.5
Principles of Recreation Planning
An exploration of alternative approaches to the planning of recreation opportunities with an emphasis on community and municipal settings. The demand for and supply of recreation opportunities; standards, models and systems; recreation planning policies and agencies; and selected recreation planning issues.
Prereq: GEOG 101 or ENV S 195, REC 332 or equivalent

REC 432 3C 0.5
Visitor Management and Interpretation
Concepts, philosophy and practices of visitor management and interpretation related to the use, conservation and preservation of cultural and natural heritage areas.
Prereq: REC 332 or consent of instructor

REC 433 3C 0.5
People in Natural Areas
Designing and managing for people in natural areas. Behavioural research and its relevance to the design and operation of natural areas and facilities will be emphasized. Means of understanding and involving neighbouring and visiting public and indigenous people in the planning, design and management of natural areas will be studied.
Prereq: REC 334/ENV S 334
Cross-listed as ENV S 433

REC 434 3C 0.5
Advanced Park Planning and Management
A study of policies, procedures, and practices relative to the management of natural resources in parks. Emphasis is placed on an ecological systems approach to management as it relates to parks at all levels of government.
Prereq: REC 334/ENV S 334
Cross-listed as ENV S 434

REC 435 3C 0.5
Recreation Resource Policy
A study of policies, policy development and policy gaps related to recreation resources in Canada. Based on a literature review and discussion of decision-making procedures, roles and tools used in the recreation field; students are required to research real and theoretical situations for seminar presentation.
Prereq: REC 230 or consent of instructor

REC 436 2C,2L 0.5
Marine Recreation and Conservation
Analysis of current issues, management concepts and processes related to recreational use and conservation of coastal and offshore areas. International examples will be used to highlight approaches to planning and management issues.
Prereq: REC 334 or equivalent

REC 455 3C 0.5
Senior Seminar in Therapeutic Recreation
This course is designed to facilitate an in-depth exploration and analysis of philosophical issues and interdisciplinary theories to discuss how they relate to therapeutic recreation practice and research.
Prereq: REC 251, 350, 355 and fourth-year standing

REC 470/471 3C 0.5/0.5
Research Project
An independent research project on an approved topic supervised by a faculty member.
REC 470 includes an approved design and completion of the first segment of the paper.
Prereq: REC 270, 371
REC 471 requires the completion of the project begun in REC 470.
### Course Descriptions

**Recreation and Leisure Studies**

**Religious Studies**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>REC 475</td>
<td>Directed Study in Special Topics</td>
<td>For the student who desires to pursue a particular topic in depth through guided independent research. A faculty member must approve a student's project prior to registration. Students may take only two directed studies courses for undergraduate degree. See REC 370. Prereq: Faculty approval</td>
</tr>
<tr>
<td>REC 480</td>
<td>Tourism Planning, Development and Marketing</td>
<td>Covers the role of tourism in economic and community development, and the roles of government and industry in formulating tourism policy. Students learn through case studies and practical assignments. Prereq: REC 280</td>
</tr>
</tbody>
</table>

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**Religious Studies**

**Undergraduate Officer**  
A.F. Thompson, HH 324, ext. 2153

Courses not offered in the current academic year are listed at the end of this section.

**Introductory Note**

Numbers below the course description indicate the area of Religious Studies to which the course belongs. Explanation is provided in the Arts program section.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RS 100A-K</td>
<td>Introduction to Religion</td>
<td>An introduction to Religion, religious phenomena, beliefs, ideas, practices and experience through the study of material and examples from the various fields in Religious Studies.</td>
</tr>
<tr>
<td>RS 100A</td>
<td>F,W 3C 0.5 Religions of the East</td>
<td>An introduction to the religious traditions of the East: history, religious beliefs and practices of Hinduism, Buddhism, Confucianism, Taoism and Shinto.</td>
</tr>
</tbody>
</table>

### Area 1

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>RS 100B</td>
<td>F 3C 0.5 Religions of the West</td>
<td>Encounter with Judaism, Christianity and Islam: the characteristics and interaction of the 3 major religious traditions originating in the Middle East that have shaped the image of the Western World.</td>
</tr>
<tr>
<td>RS 100C</td>
<td>F,W 3C 0.5 Religious Quests</td>
<td>Profiles, biographies and autobiographies of individuals in search of ultimate meaning. Persons studied are spiritual seekers from all walks of life: traditional religious figures, artists, novelists, scientists and others.</td>
</tr>
<tr>
<td>RS 100D</td>
<td>F,W,S 3C 0.5 Biblical Studies 1</td>
<td>A survey of the literature, history and religion of ancient Israel as seen in its cultural setting in the ancient Near East.</td>
</tr>
<tr>
<td>RS 100E</td>
<td>F,W,S 3C 0.5 Biblical Studies 2</td>
<td>A survey of the literature, history and religious thought of the Christian community during the New Testament period as seen in its cultural setting in the Greco-Roman world.</td>
</tr>
<tr>
<td>RS 100F</td>
<td>F,W,S 3C 0.5 Catholic Theology</td>
<td>A study of the principal teachings of the Christian Faith affecting Catholics today. Topics will include Bible and Tradition; worship and sacraments; authority; changing views concerning laity, women, ministry, and ecumenism.</td>
</tr>
<tr>
<td>RS 100G</td>
<td>F,W 3C 0.5 Introduction to Theology</td>
<td>The basics of Christian theology explored systematically and historically: theological language, revelation and truth, God and creation, sin and the fall, Christ and salvation, tradition and church, consummation and the end of history.</td>
</tr>
<tr>
<td>RS 100H</td>
<td>F,W 3C 0.5 Elementary Biblical Hebrew</td>
<td>An introductory course designed to tender a reading knowledge of Biblical Hebrew: the sounds and forms of the language followed by the reading of selected texts from the Hebrew Bible. Cross-listed as RE 140-3C Taught at WLU</td>
</tr>
<tr>
<td>RS 106A</td>
<td>F 3C 0.5 Elementary Biblical Hebrew</td>
<td>A continuation of the Introduction to Biblical Hebrew. Cross-listed as RE 140-3C Taught at WLU</td>
</tr>
<tr>
<td>RS 106B</td>
<td>W 3C 0.5 New Testament Greek</td>
<td>An introduction to Greek grammar with appropriate grammatical exercises and development of vocabulary. RS 106A and GRK 100A may not both be taken for credit.</td>
</tr>
<tr>
<td>RS 106D</td>
<td>W 3C 0.5 New Testament Greek</td>
<td>A continuation of the study of Greek grammar with an exegetical study of some texts from the Gospel of Mark.</td>
</tr>
<tr>
<td>RS 200</td>
<td>W,S 3C 0.5 The Study of Religion</td>
<td>An exploration of the nature of religion through: 1) the history of the study of religion, 2) exposure to varying methods and ways of approaching religious phenomena, and 3) consideration of accounts of religious experience.</td>
</tr>
<tr>
<td>RS 205</td>
<td>F,W 3C 0.5 The Hebrew Prophets</td>
<td>A study of the prophetic movement from Amos to Malachi in the historical, social, and religious context of Israel and the ancient Near East.</td>
</tr>
<tr>
<td>RS 208</td>
<td>W 3C 0.5 The Parables of Jesus</td>
<td>Detailed examination of the stories Jesus told, their form, method, message, and significance for religious thought, past and present.</td>
</tr>
<tr>
<td>RS 209</td>
<td>F 3C 0.5 The Apostle Paul: Life and Letters</td>
<td>An examination of the career and thought of Paul as seen in his letters and in the Acts of the Apostles.</td>
</tr>
<tr>
<td>RS 214</td>
<td>F 3C 0.5 Buddhism</td>
<td>An introduction to the unifying beliefs and philosophical presuppositions of the Buddhist world-view, and an overview of the diverse forms of Buddhism in South and South-East Asia, Tibet, China and Japan.</td>
</tr>
</tbody>
</table>

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**Area 2**

**Area 3**

**Area 4**

**Area 5**

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**Cross-listed as RE 140-3C Taught at WLU**
Course Descriptions
Religious Studies

RS 215 W 3C 0.5
Religion in China
An historical overview of the primary expressions of Chinese spirituality, from the Ancient Period to the 20th century. Special attention will be given to the interaction between the indigenous traditions (folk religion, Confucianism, Taoism) and Buddhism.

Area 1

RS 216 F 3C 0.5
Islam
An introduction to the Islamic faith and practice, with a review of the development, achievements and impact of the Muslim community from Muhammad to the present day.

Area 1

RS 217 W 3C 0.5
Judaism
An introduction to the religious tradition of the Jews, in terms of beliefs, practices, ideals and institutions from the beginning to the present time.

Area 1

RS 221 F,W 3C 0.5
Sects, Cults and New Religious Movements
An analysis of minority religions considered deviant by the dominant society such as the Amish, Mormons, and Jehovah's Witnesses with special consideration of the recent new religious movements including Unification (Moonies), Scientology and Krishna consciousness.

Cross-listed as SOC 263

Area 5

RS 230 F,W 3C 0.5
History of Christianity
The development of Christianity in its Roman Catholic, Eastern Orthodox and Protestant traditions from the time of Christ to the present.

Cross-listed as HIST 235

Area 2

RS 231 F.S 3C 0.5
History of Christian Thought
An analysis of the major theological developments in the Christian traditions from the apostolic era to the present.

Area 4

RS 236 F,W 2C,1D 0.5
Human Sexuality and Christian Morality
An investigation of the moral implications of an evolving sexual consciousness in the Christian tradition.

Prereq: Second year standing or consent of instructor

Area 4

RS 255 W.S 3C 0.5
Christian Ethics
An examination of the development of Christian ethics, the Christian Doctrine of Man, Christian ethics and society, and faith and reason in ethical decision.

Area 4

RS 256 W 3C 0.5
Current Ethical Issues
An examination of specific current individual and social problems such as human sexuality, social justice, urban decay, and human rights, in the light of Christian moral consciousness.

Area 4

RS 260 W 3C 0.5
Issues in Science, Technology and Religion
A study of the questions raised by the interaction of religious faith with modern scientific and technological approaches to understanding the physical, social and psychological dimensions of our world.

Area 5

RS 263 F 3C 0.5
Justice, Peace and Development
An examination of movements, communities, and theologies which express a Christian hope for justice, peace and development in the encounter with injustice, oppression and poverty.

Area 4

RS 266 F 2C,1D 0.5
Film and the Quest for Meaning 1
An exploration of spiritual themes and issues in the cinema. An assessment of film's special characteristics as an art form capable of addressing the human quest for a significant existence. Emphasis upon the films of Ingmar Bergman.

Cross-listed as FINE 252
Film fee $5.00.

Area 5

RS 267 W.S 2C,1D 0.5
Film and the Quest for Meaning 2
A consideration of selected themes — death, evil, guilt, fate, alienation, courage, love, redemption — in the films of several of today's leading directors. Emphasis upon a variety of directors from divergent cultural backgrounds.

Cross-listed as FINE 253
Film fee $5.00.

Area 5

RS 270 F 3C 0.5
Psychology of Religion
A study of theories of the psychological nature of religious experience, the sources of religious belief and the religious significance of psychological phenomena. Topics include faith, doubt, evangelism, conversion, faith healing, mysticism, drugs and religious experience, tongues-speaking.

Area 5

RS 271 W 3C 0.5
Personality and Religion
A study of the psychology of personality in its relationship between personality and religious thought, experience and behavior.

Area 5

RS 272 W 3C 0.5
Sacred Places
From Mecca to Benares, Stonehenge to Chartres — a consideration of sacred cities, shrines, rivers, mountains, worship centres and other places which have inspired the spiritual imagination of individuals and communities within various religious traditions.

Area 5

RS 281 F 3C 0.5
Theology of Worship and Sacrament
The course will examine Christian corporate worship in its existential reality and historical development. New trends will be analyzed in the light of both tradition and present needs.

Area 4

RS 291 A-D
Studies in the History of Religion

RS 292 A/B F J 0.5/0.5
Women in the Church
A multi-disciplinary examination of the evolution of the relationship between women and the church in the Christian tradition.

Area 5

RS 269 F 3C 0.5
The Religious Art of India
An approach to understanding the myths, symbols and spirituality of Indian religion through a study of representative art, architecture and folk literature of Hinduism, Jainism, and Indian Buddhism.

Cross-listed as FINE 218A

Area 5

RS 270 F 3C 0.5
Psychology of Religion
A study of theories of the psychological nature of religious experience, the sources of religious belief and the religious significance of psychological phenomena. Topics include faith, doubt, evangelism, conversion, faith healing, mysticism, drugs and religious experience, tongues-speaking.

Area 5

RS 271 W 3C 0.5
Personality and Religion
A study of the psychology of personality in its relationship between personality and religious thought, experience and behavior.

Area 5

RS 272 W 3C 0.5
Sacred Places
From Mecca to Benares, Stonehenge to Chartres — a consideration of sacred cities, shrines, rivers, mountains, worship centres and other places which have inspired the spiritual imagination of individuals and communities within various religious traditions.

Area 5

RS 281 F 3C 0.5
Theology of Worship and Sacrament
The course will examine Christian corporate worship in its existential reality and historical development. New trends will be analyzed in the light of both tradition and present needs.

Area 4

RS 291 A-D
Studies in the History of Religion

RS 292 A/B F J 0.5/0.5
Women in the Church
A multi-disciplinary examination of the evolution of the relationship between women and the church in the Christian tradition.

Area 5
RS 293A W 3C 0.5
Religious Experience of the Young
A multi-faceted examination of the religious development of the pre-adult, including such considerations as the moral, psychological, philosophical, sociological, sacramental and spiritual aspects.
Area 5

RS 298
Directed Reading in Special Subjects

RS 305A F 3C 0.5
Intermediate New Testament Greek
Prereq: RS 106 or consent of instructor.
Area 3

RS 305B W 3C 0.5
Intermediate New Testament Greek
Prereq: RS 106 or consent of instructor.
Area 3

RS 307A A-D
Selected Topics in Biblical Studies
Special topics will be offered in the Fall, 1991-92. Consult Department.

RS 309 W 3C 0.5
New Testament Themes
A comparative study of the distinctive ways in which New Testament writers view key issues in the early Church; e.g., freedom and authority, social responsibility, the role of law, relations with the Jewish religion, the person of Jesus. An attempt will be made to relate their views to issues facing Christianity today.
Prereq: RS 100F or consent of instructor.
Area 3

RS 310 W 3C 0.5
The Sacred Book of Islam
A study of the Koran (Qur'ân) as literature and as the Holy Book of Islam with reading and interpretation of selected chapters (sûrahs), in translation.
Area 1

RS 313 W 3S 0.5
Indian Spirituality in the Modern Era
This seminar course will provide for "in-depth" studies of some of the creators of modern Hindu consciousness: Vivekananda, Gandhi, Tagore, Aurobindo and contemporary gurus.
Prereq: RS 100A or consent of instructor.
Area 1

RS 325 F 3C 0.5
Medieval Church History
An exploration of the development of the Church from 604 to 1449. Topics will include leadership struggles in church and state, crusades, heresy and inquisition, the western schism and the conciliar period.
Cross-listed as HIST 304
Area 2

RS 329 W 3C 0.5
Mothers of the Church
This course will examine the writings of women Christians from Perpetua to Mary Jr. Lavin, their historical and cultural setting and will attempt to gauge their contemporary significance for women.
Prereq: RS 292A or B, or consent of instructor.
Area 2

RS 331A F 3C 0.5
The Church in the Modern World
A study of the recent transformation of the Roman Catholic Church through the events, movements, personalities, and historical realities of the past fifty years.
Area 2

RS 331B W 3C 0.5
The Church in the Modern World
A critical study of the church's roles in contemporary secular society.
Area 2

RS 336 F 3C 0.5
Contemporary Theology
A study of major themes and movements in contemporary theology, with reference to selected thinkers, such as Barth, Tillich, Buber, de Chardin and Rahner.
Prereq: RS 231 or consent of instructor.
Area 4

RS 339 W 3C 0.5
Luther and Calvin: The Reformation
In Theological Outline
This course will examine the religious experience and the theologies of Martin Luther and John Calvin in their respective historical contexts.
Prereq: One of RS 100H, 230, 231 or consent of instructor.
Area 4

RS 350 F, W 3C 0.5
Christian Spirituality and Mysticism
A study of the spiritual experience and mystical knowledge of great Christian mystics, from the desert Fathers and Hesychasts in the Eastern Orthodox tradition to the mystical schools of the Western Catholic tradition.
Prereq: RS 230 or 231 or consent of instructor
Area 2

RS 353 F 3C 0.5
The Bible and Peace
An examination of the unity and diversity of biblical views of peace with attention to their relevance for the various dimensions of the contemporary quest for peace.
Prereq: RS 100E or 100F or consent of instructor.
Area 4

RS 356 W 3C 0.5
Bioethics And Religious Values
This course will study issues such as sexual ethics, eugenics, euthanasia, suicide, genetic screening, organ transplants, organ and embryo banking, as they stand in relation to traditional religious values.
Area 4

RS 369A-F
Study-Travel Seminar in Religion
Consult Department for offerings 1991-92

RS 369D S 1.0
Religion and Culture in the Middle East
A travel seminar to Egypt (including the Sinai) and Greece to study religious dimensions expressed in the culture, community and social life in these countries with a main emphasis on the Muslim and the variety of Christian traditions.
Prereq: A minimum second-year standing or consent of instructor.
Area 1

Students should file an application form with the Director before registering for this course.
RS 370 F 3C 0.5
Dreams in Religious Experience
The course examines the place of dreams in religious experience from ancient to modern times. Present day advances in understanding dream symbols will be explored, as well as the possibility of incorporating the use of dreams in one's personal religious growth and development.
Prereq: RS 271 or consent of instructor
Area 5

RS 371 W 3C 0.5
Religion and Suicidal Behaviour
A study of self-destructive behaviour and its relation to relevant religious concepts. The range of experience from illness to suicide will be explored and related to the concepts of guilt, hope and meaning in the Christian faith.
Prereq: RS 271 or consent of instructor
Area 5

RS 375 W 3C 0.5
Religion and Psychotherapy
A review and analysis of the dialogue between theistic religion in the West and the personality sciences since Freud, their respective views of God, man, sin, sickness and the therapeutic process. Clinicians and theorists in psychotherapy and religion from the surrounding community will contribute to the exploration.
Prereq: RS 270 or 271 or consent of instructor
Area 5

RS 382 S 3C 0.5
Theology of Marriage
A study of the development of the theology of marriage in the Christian tradition.
Prereq: RS 236/256 or 281/282 or consent of instructor
Area 4

RS 383 W 3C 0.5
Shapers of the Roman Catholic Tradition
An examination of some influential thinkers in the Christian tradition who have played a critical role in Roman Catholic theology; including individuals like Augustine, Thomas Aquinas, John Henry Newman, Karl Rahner.
Prereq: RS 1001 or 230 or 231 or consent of instructor
Area 4

RS 398-399 F,W,S
Directed Reading in Special Subjects

RS 400A-H
Special Topics in Religious Studies
Special topics will be offered in 1991-92. Consult department.

RS 490A F,W 0.5
Honours Seminar
A course of study and research designed to provide the student with guidance and supervision towards completing an Honours research assignment.
Prereq: Fourth-year standing and consent of the Undergraduate Officer

RS 490B F,W 0.5
Honours Seminar
A continuation of the above.
Every student in the Honours RS Program is required to take RS 490A and 490B.

RS 590-597 F,W 0.5
Directed Research in Special Subjects for Graduate Students

RS 598-599 W,S R 0.5
Directed Research in Special Subjects for Graduate Students

COURSES NOT OFFERED 1991-92
RS 100D Religious Movements
RS 201 New Testament Greek
RS 213 Hinduism
RS 220 Evangelical Christianity
RS 225 The History and Culture of the Orthodox Church
RS 229 The Cult of Mary
RS 232A Jesus Christ in Contemporary Perspective
RS 232B Jesus Christ in Historical Perspective
RS 234 Evangelical and Anabaptist Christianity
RS 257 The Thought and Practice of Christian Peacemaking
RS 261 Women and the Great Religions
RS 266A Religious Perspectives in Contemporary Literature
RS 266B Religious Perspectives in Contemporary Canadian Literature
RS 274 Religious Approaches to Personal Crises
RS 282 New Perspectives in Sacramental Theology
RS 290B The Just Society
RS 290C Gospel and Liberation
RS 302 The Gospel of John
RS 304 Modern Study of Jesus
RS 306A Intermediate Biblical Hebrew
RS 306B Intermediate Biblical Hebrew
RS 308 Old Testament Themes
RS 311 Hindu Scriptures
RS 314 Zen Buddhism

RS 315 The Narrative Expression of Canadian Native Religions
RS 316 Canadian Native Religious Traditions
RS 318 Islam and Christianity
RS 322 Radical Reformation
RS 334 Islamic Theology, Philosophy and Mysticism
RS 335 Modern Theology
RS 344 Theology of Radical Pentecostalism
RS 354 War and Peace in Christian Theology
RS 355 Interreligious Encounter and Dialogue
RS 360 Religion and the Arts
RS 373 Folk Religion: Custom, Belief and Ritual
RS 450A Study Term Abroad

Russian

For courses in Russian see Germanic and Slavic Languages and Literatures.

Science

Science labelled courses (other than Liberal Science Core Courses) are offered by the Departments of Biology, Chemistry, Earth Sciences and Physics, determined by course content.

Introductory Notes

1. The Faculty of Science offers the following courses of a general nature intended for students registered in other Faculties (Applied Health Sciences, Arts, Environmental Studies, Engineering, Mathematics) as well as for Science students desiring electives.

2. Normally, no more than three of the Science credits may be applied towards any Science degree program. (Students in Liberal Science programs should consult the program description on page 14:10.)

3. Liberal Science Core Courses are SCI 260, 261, 263, 265, 267 and 268 (when offered). Other SCI courses, including others offered by Liberal Sciences, are Not Liberal Science Core Courses.
SCI 205 F.W 3C 0.5
Physics of High Fidelity Sound
Reproduction
An application of elementary physical principles to the study of acoustics and high fidelity sound reproduction. This course will look at the physics behind the design of modern equipment and explain the meaning of its specifications. Several evening clinics will be held where interested students may measure the properties of their own or available systems in a laboratory setting.
Prereq: At least one year of Secondary School Physics

SCI 219 F 2C 0.5
Chemistry in Modern Society
The impact of chemistry on the environment and modern society will be discussed under such topics as carcinogens, lead pollution, chemical warfare, food additives, pesticides, contraception, ozone layer, "social" (marijuana, cocaine) and sport drugs. Topics vary from year to year.
Prereq: At least one year of Secondary School Chemistry

SCI 220 W.S 0.5
Chemistry of Pollution
A study of the chemistry involved in pollution problems encountered with consumer products and in selected industries. Progress on overcoming the pollution will be discussed with emphasis on the Chemistry. (Open to all interested students.)
Prereq: At least one year of Secondary School Chemistry
Available by Correspondence only

SCI 237 F 3C 0.5
Descriptive Astronomy
A survey course in astronomy (primarily intended for students in Applied Health Sciences, Arts, Environmental Studies). The solar system, stars, the Milky Way, galaxies and the Universe. Open to students in all years. Not for Engineering, Mathematics or Science students.
Antireq: SCI 238

SCI 238 W.S 3C 0.5
Descriptive Astronomy
A survey course in astronomy intended for Mathematics, Engineering and Science students. The solar system, the Sun and planets, stars, the Milky Way, galaxies and cosmology. Open to students in all years.
Antireq: SCI 237 (SCI 238 is a more quantitative version of SCI 237.)

Students interested in the above courses in Astronomy (i.e. SCI 237, 238) should note that because of overlapping material both courses may not be taken for credit, only the one most suitable to their background. Students with a weak background in Physics and/or Mathematics may well find it advisable to take SCI 238 before taking PHYS 275.

SCI 250 W 3C 0.5
Environmental Geology
The influence of geological factors on the natural environmental: natural hazards; efforts of engineering works on the environment; geological aspects of water resources and water disposal with particular attention to solid waste (garbage) and deep well injection of liquid wastes.
Prereq: Students will find a course in Physical Geography or Earth Sciences to be an advantage. Students whose major field is Earth Sciences may not take this course for credit.
Antireq: EARTH 358

SCI 255 W 2C 0.5
The Biology of Aging
An introduction to the biological mechanisms of aging at the molecular, cellular and systemic levels. Topics to be discussed will include the theories of aging, methods for studying the aging process, the role of diseases in aging and chronological changes in organisms during aging.
Cross-listed as GERON 255

SCI 260 W 3C 0.5
The Science of Senses
Vision, hearing, smell, taste and other senses. A multidisciplinary view of some of the basic principles underlying these, with emphasis upon concepts which are common to all senses. Various aspects of the senses (e.g. social consequences of sensory impairment, esthetics, historical theories of sensory function) are discussed and demonstrated.
Liberal Science Core Course

SCI 261 W 3C 0.5
Models in Science
Origins and rise of some important scientific models. Resistance to and acceptance of new models. Strengths and weaknesses of some current models. Examples will be drawn from three different areas of science, and may vary from year to year.
Liberal Science Core Course

SCI 263 F 3C 0.5
Science and Society
Selection of areas of science for development and commercial exploitation. Economic and social impact of science. Societal pressures on science. At present, the focus of this course is biotechnology.
Prereq: Successful completion of one year of Honours or General studies.
Year One students will not be admitted to this course.
Liberal Science Core Course

SCI 265 W 3C 0.5
Scientists and the Science Community
Professionalism, ethical and political issues, and other aspects of how science is done will be raised. Memoirs and other writings of scientists about their science will be included in the readings.
Prereq: Successful completion of one year of Honours or General studies.
Year One students will not be admitted to this course.
Liberal Science Core Course

SCI 267 F 3C 0.5
Topics in History and Philosophy of Science
Selected areas or cases chosen may vary from year to year. Current theme: measurement.
Liberal Science Core Course

SCI 268A-L
Experimental Course
Occasional courses, for example taught by a visiting faculty member, or under development for future permanent status.
Liberal Science Core Course

SCI 270 W 3C 0.5
Nuclear Science
A non-mathematical general treatment of the following areas of nuclear science: historical development and discovery of new fundamental particles; artificial transmutation of elements; nuclear sources of energy; biological effects of radiation and use of radioisotopes in industry, medicine and agriculture. The impact of nuclear science on social, economic and political systems will be discussed.
Prereq: At least one year Secondary School Chemistry or Physics
Course Descriptions
Science
Sexuality, Marriage and the Family (Studies in)

SCI 351 F, W, S 0.5
Human Biology 1
An introduction to selected topics in human physiology and consideration of factors that influence normal physiological function. Topics discussed include the structure and mechanisms of action of nerves, muscles, the cardiovascular and respiratory systems.
Antireq: BIOL 273 (Formerly BIOL 233)
Offered by Correspondence only for 1991-92.

SCI 352 F, W, S 0.5
Human Biology 2
An introduction to selected topics in human physiology. Attention will be given to the areas of homeostasis, nutrition, digestion, reproduction and the endocrine hormones.
Antireq: BIOL 273 (Formerly BIOL 233)
Offered by Correspondence only for 1991-92.

SCI 355 F 2C 0.5
Biology of Cancer
An introduction to cell and developmental biology in relation to cancer in the human body.
Students whose major field is Biology may not take this course for credit.
Offered in 1990 and alternate years thereafter.

SCI 369 F, W 1T 0.5
Liberal Science General Essay
Details available from the Liberal Science Office. For students in their third year of Liberal Science only.

SCI 410 0.5
Technical Report
(For Students in all Co-op programs in Science)
Technical reports covering work-term assignments are submitted by all Co-op Science students. These will be carefully evaluated for technical content and writing ability. Students admitted to a Co-op program with advanced standing should consult with the Department of Co-operative Education regarding sequence of work terms and satisfaction of work report requirements. A word Grading system will be used and will range from Excellent to Unsatisfactory. This course will be added to the student's transcript at the completion of Year 4 and will be given 0.5 course credit; this credit is to be in addition to the regularly required number of course credits shown in the program listings.

SCI 453 F 2C 0.5
Marine Ecosystems and the Human Impact
Study of the oceans from a biological point of view, and consideration of the effects of exploitation and pollution upon the animals and plants that inhabit them.
Students whose major field is Biology may not take this course for credit.
Antireq: BIOL 450

SCI 454 W 2C 0.5
Biology of Freshwater Pollution
Study of lakes, rivers and streams from a biological point of view, and consideration of the effects of pollution upon the animals and plants that inhabit them.
Students will find a course in Biology to be an advantage. Students whose major field is Biology may not take this course for credit.
Antireq: BIOL 451

SCI 462 F 2C 0.5
Biology of Food Production
A survey of world food production from the biologist's viewpoint. Topics: nutrition; food chains; origins of agriculture; basic plants and animal food crops; primitive and modern scientific agricultural practices and the environmental implications of each.

SCI 468 2C 0.5
Liberal Science Senior Seminar
A forum for intensive discussion of topics of interest with resident or visiting speakers.
Prereq: Year Four standing in Liberal Science (or in another program with consent of instructor). Enrolment may be limited.

SCI 469 F, W 1T 0.5
Liberal Science General Essay
Details available from the Liberal Science Office. For students in their final year of Liberal Science only.

Sexuality, Marriage and the Family (Studies in)
Undergraduate Officer
J.P. Theis, St. Jerome's College, 884-8110

Courses not offered in the current academic year are listed at the end of this section.

SMF 201 A/B F, W 3C 0.5/0.5
Introduction to Sexuality and Sex Education
A multidisciplinary examination of human sexuality and sex education.
Offered at St. Jerome's College
Formerly: ARTS 249A/B
c

SMF 2019 A F 3C 0.5
Introduction to Sexuality and Sex Education 1
A broad multidisciplinary overview of perspectives on human sexuality.
Formerly: ARTS 249A
Antireq: PSYCH 236

SMF 201B W 3C 0.5
Introduction to Sexuality and Sex Education 2
A multidisciplinary examination of selected topics in human sexuality. The significant principles of sex education and some of its most relevant methods and programs will be discussed as well.
Formerly: ARTS 249B
Prereq: SMF 201A or PSYCH 236 or consent of the instructor

SMF 202A/B F, W 3C 0.5/0.5
Introduction to Marriage and the Family
A multidisciplinary examination of marriage and the family.
Offered at St. Jerome's College
Formerly: ARTS 250A/B

SMF 202A F 3C 0.5
Introduction to Marriage and the Family 1
A broad multidisciplinary overview of perspectives on marriage and the family.
Formerly: ARTS 250A
SMF 202B W 3C 0.5  
Introduction to Marriage and the Family 2  
A multidisciplinary examination of selected topics regarding marriage and the family. Methods for incorporating significant knowledge about marriage and family into family life programs will also be examined.  
Prereq: SMF 302A or consent of instructor

SMF 301A/B F,W 3C 0.5/0.5  
Advanced Study of Sexuality and Sex Education 1 & 2  
A multidisciplinary and detailed analysis of human sexuality and sex education.  
Offered at St. Jerome's College  
Formerly: ARTS 349A/B

SMF 302A/B F,W 3C 0.5/0.5  
Advanced Study of Marriage and the Family  
A multidisciplinary and detailed analysis of marriage and the family.  
Offered at St. Jerome's College  
Formerly: ARTS 350A/B

SMF 302A F 3C 0.5  
Advanced Study of Marriage and the Family 1  
A detailed analysis of various disciplinary perspectives on marriage and the family.  
Offered at St. Jerome's College  
Formerly: ARTS 350A

SMF 302B W 3C 0.5  
Advanced Study of Marriage and the Family 2  
An advanced multidisciplinary examination of some special and selected topics in the area of marriage and the family.  
Offered at St. Jerome's College  
Formerly: ARTS 350B

SMF 303A F 3C 0.5  
Introduction to Marriage and Family Therapy 1  
This course will examine the clinical treatment of marriages and families by adopting a structural frame of reference and using a family life cycle perspective. The objective is to develop a useful model for intervention in marriages and families.  
Prereq: SMF 202A or consent of the instructor

SMF 303B W 3C 0.5  
Introduction to Marriage and Family Therapy 2  
Starting from the theoretical basis established in SMF 303A, this course will give students an idea of the practice of marriage and family therapy by having them observe (through viewing videotapes and films) clinical interventions in families and having them role-play strategies for such interventions.  
Prereq: SMF 303A or consent of the instructor

SMF 403 W 3C 0.5  
Independent Study: Special Topics in Sexuality  
An independent, in-depth study, based on empirical research and/or extensive reading, of a topic in the area of sexuality. The project must be approved by the academic supervisor of the course prior to registration. Open to students in the SMF Honours option.  
Prereq: SMF 301B or consent of the instructor

SMF 403B F 3C 0.5  
Independent Study: Special Topics in Marriage and the Family  
An independent, in-depth study, based on empirical research and/or extensive reading, of a topic in the area of marriage and the family. The project must be approved by the academic supervisor of the course prior to registration. Open to students in the SMF Honours option.  
Prereq: SMF 302B or consent of the instructor

COURSES NOT OFFERED 1991-92  
SMF 301B Advanced Study of Sexuality and Sex Education 2

Social Development Studies

Undergraduate Officer  
M. Smyth, Renison College, Rm 3, 884-4400

Courses not offered in the current academic year are listed at the end of this section.

INTERDISCIPLINARY SOCIAL SCIENCE

ISS 131R W 3C 0.5  
Social Ideas, Social Policy and Political Practice 1  
An introduction to some of the major social and political ideas of Western civilization. Attention is given to the influence and applicability of these ideas to social policy and political practice in contemporary Canada.

ISS 150R F,W,S 3C 0.5  
Lifespan Processes: The Normal Events  
An examination of the significant psychosocial events during the lifespan with consideration of the impact of crises. Topics may include attachment, loss, stress, identity crisis, role change, mid-life transition.

ISS 220R F,W,S 3C 0.5  
Changing Concepts of Childhood  
Childhood has changed as a social and cultural concept. This course will trace these changes, examining sociological, psychological, cross-cultural, historical and political factors. Art and literature will also be used to reflect attitudes about childhood.

ISS 240R F 3C 0.5  
Art and Society  
Themes and issues concerning the relationships of the individual and society as expressed through the arts. Also, a consideration of the role of art and artists in society and an examination of topics in the field of art and therapy.  
Prereq: At least two term courses in the social sciences
ISS 250R F 3C 0.5
Social Statistics
This introductory level statistics course will emphasize the collection, manipulation, descriptive presentation and statistical analysis of social research data using a variety of qualitative and quantitative methods.
Prereq: Second year standing and at least two term courses in the social sciences or consent of the instructor
See overlapping content note (Grading Systems, item 6) on page 8:7

ISS 251R W 3C 0.5
Social Research
Introduction to the philosophy and methodology of applied social science research including treatment of the problems and strategies of research design and execution.
Prereq: Second year standing and at least two term courses in the social sciences or consent of the instructor ISS 250R or its equivalent also recommended.

ISS 320R F 3C 0.5
Critical Encounter with the Nature of Man
An attempt to increase students' understanding of human nature and deepen their awareness of some fundamental issues in the life of 20th century man. The approach is interdisciplinary with emphasis on such themes as the meaning of self-knowledge, loneliness and anxiety, freedom and purpose in human life, and the nature of human happiness.
Prereq: Courses in at least one of the Social Sciences or Philosophy, or consent of instructor.

ISS 350D W 3C 0.5
Adult Life Crises and Events
A study of normal events occurring during the adult years. why they happen and how we cope with them. Relying on research, popular literature, and life experiences, students examine social change, the future, adult development and adjustment.
Prereq: ISS 150R or consent of instructor

ISS 350E F.S 3C 0.5
Family Law and Social Work
Consideration of the court system; investigation of divorce, mediation, court mandated custody, access and juvenile predispositional assessment, child welfare, psychiatric advocacy, corrections, and highlighting of professional, ethical, confidentiality, civil and criminal liability issues for social workers.
Prereq: Second-year standing

ISS 350H F.S 3C 0.5
Values and the Contemporary Family
An exploration of how religious, economic, political and other social institutions shape values in our society, and what impact society's changing values are having upon marriage and the family.
Prereq: At least two social science courses
Cross-listed as SOCWK 350H

ISS 399R/399R F.W.S R 0.5/0.5
Independent Study
Interdisciplinary focus, in greater depth than is available in other courses, on a selected area of concern to the student. Available to individuals or small groups of third or fourth year Social Development Studies students and arranged with one of the program's faculty members.
Prereq: Permission of Undergraduate Officer

ISS 499A/B F.W.S T 0.5/0.5
Senior Honours Essay
The essay will normally be related to the student's chosen theme area, supervised by one faculty member, and critically examined by faculty from all areas of the program.
Prereq: Open to senior honours students only
A letter grade for ISS 499A will be submitted only after the completion of ISS 499B

PSYCHOLOGY

PSYCH 120R F 3C 0.5
Introductory Psychology
Basic concepts and techniques of modern psychology as a behavioural science, with special emphasis on social aspects of behaviour. Topics may include the nervous system, perception, learning, memory, cognition, motivation, emotion, development, personality, social influences, psychopathology and psychotherapy.
Students may receive credit for only one of PSYCH 120R or PSYCH 101

PSYCH 121R W 3C 0.5
Introductory Psychology (Special Topics)
A continuation of PSYCH 120R with in-depth study of some selected topics.
Prereq: PSYCH 120R
Students may receive credit for only one of PSYCH 121R or PSYCH 102

PSYCH 322R F 3C 0.5
Personality Theory
An examination of the major theories of personality including consideration of the psychoanalytic, dispositional, humanistic, and behavioural models.
Prereq: An introductory Psychology course
Cross-listed as PSYCH 355
Students may receive credit for only one of PSYCH 322R or PSYCH 355

PSYCH 323R W 3C 0.5
Abnormal Psychology
A survey of concepts, theory, and research dealing with the nature and etiology of behavioural abnormality. Topics include neurosis, schizophrenia, depression, psychophysiological and behavioural disorders.
Prereq: An introductory Psychology course
Cross-listed as PSYCH 357
Students may receive credit for only one of PSYCH 323R or PSYCH 357

PSYCH 334 F.W.S 3C 0.5
Theories of Individual Counselling Psychology
An introduction to the methods, theories and problems in individual counselling psychology.
Prereq: An introductory Psychology course

PSYCH 367R-369R 0.5
Special Topics in Psychology
One or more term courses will be offered from time to time as announced by the Social Development Studies Program. Subjects will be dependent upon special research and/or instructional interests of faculty.

PSYCH 399R/399R F.W.S R 0.5/0.5
Independent Study
An independent in-depth study of a selected area of concern to the student within the discipline of Psychology. Available to individuals or small groups of third or fourth year Social Development Studies Majors and arranged with one of the faculty members from the program.
Prereq: Permission of Undergraduate Officer
SOCIAL WORK

SOCWK 001R W 3S 0.0 Casework Technique Seminar
A required non-credit seminar for Social Work Diploma students. Includes further consideration of topics introduced in SOCWK 350E and ongoing discussion of students' practicum experiences.

SOCWK Diploma students only

SOCWK 120R F,W,S 3C 0.5 Introduction to Social Work
Presentation of the value, knowledge, and skill base, principles and purposes of the profession, and an examination of methods of practice. Traditional and innovative social work settings are discussed. Historic development of Social Work and its influence on contemporary practice is reviewed.

Prereq: SOCWK 120R or consent of instructor

SOCWK 220R F,S 3C 0.5 Social Casework 1
A presentation of some of the theoretical constructs necessary for the understanding of the individual in the casework relationship, as well as an introduction to some appropriate casework interventions. Emphasis in the course will be theoretical.

Prereq: SOCWK 120R or consent of instructor

SOCWK 221R F,W,S 3C 0.5 Social Group Work
Presentation of some of the theoretical constructs necessary for an understanding of social group work as well as an introduction to methodology and interventions.

Prereq: SOCWK 120R or consent of instructor

SOCWK 222R F,W,S 3C 0.5 Community Organization 1
An examination of social work practice as it relates to functional and geographical communities. The course will explore the theoretical foundations of organization practice as well as a variety of models.

Prereq: SOCWK 120R or consent of instructor

SOCWK 230R 3C 0.5 A Christian Perspective on Social Work Practice
The course explores the relevancy and impact of the Christian faith in social work practice and examines some of the ethical issues and value conflicts facing the Christian and non-Christian social worker in practice today.

Prereq: SOCWK 120R or consent of instructor

SOCWK 240R F,W,S 3C 0.5 Palliative Care
An introduction to the concepts and practices in palliative care. Topics include historical and philosophical background, the hospice movement, current approaches in palliative care, the multi-discipline team, stress factors, suicide and cross-cultural beliefs of death, illness and loss as they affect the terminally ill and their families.

Prereq: SOCWK 120R or consent of instructor

SOCWK 241R 3C 0.5 Psycho-Social Factors in Palliative Care
An examination of the psycho-social factors that contribute to effective palliative care. Exploration of the grief process, special populations, cultural and religious considerations, family dynamics, communication skills, assessment of the social and psychological needs of the patient and family, and appropriate planning.

Prereq: SOCWK 240R

SOCWK 320R W 3C 0.5 Social Casework 2
Considers some of the intellectual components of the social work skills necessary for working with individuals. Social work theories of the individual will be examined in order for the student to learn some clinical applications relevant to the casework relationship.

Prereq: SOCWK 220R or consent of instructor

SOCWK 321R F,W,S 3C 0.5 Social Work with Families
Presentation of some of the theoretical constructs necessary for an understanding of the family in the social work relationship as well as an introduction to methodology and interventions.

Prereq: SOCWK 120R or consent of instructor

SOCWK 322R W 3C 0.5 Community Organization 2
An investigation of methods and models of social work intervention used in the process of change as it affects functional and geographic communities. Canadian examples of organizational processes and collective action of citizen groups, neighbourhoods, welfare recipients, ethnic minorities, employees, political parties and public housing tenants.

Prereq: SOCWK 222R

SOCWK 328R F 3C 0.5 Philosophy and History of Social Welfare
Social welfare from early civilization to the present. The effects of religious, political, economic, and cultural factors on social welfare development and the continuing influence of inherent attitudes, philosophies and values on this complex institution. Focus on the Canadian social welfare system.

Prereq: SOCWK 120R or consent of instructor

SOCWK 350D F,W 3C 0.5 Social Casework 3
Casework treatment issues categorized according to the character styles of clients will be examined in depth. The client's mode of functioning and symptom presentation and appropriate treatment strategies will be assessed through readings, clinical example and process recordings.

Prereq: SOCWK 320R and consent of instructor

SOCWK 350E F 3C 0.5 Social Casework Techniques
Theoretical and practical consideration of conceptual and interpersonal techniques relevant to the practice of clinical social work. Topics may include formation and use of case histories, interviewing, treatment plans, therapist-client contracts, process-recording, client disengagement.

Social Work Diploma students only.

SOCWK 350F 3C 0.5 School Social Work
The history, theory and practice of school social work in North America, particularly in Ontario. Applying theories to cases, students learn how the school social worker helps children confront problems like family breakdown and school phobia.

Prereq: SOCWK 120R
SOCWK 350H F,S 3C 0.5 Values and the Contemporary Family
An exploration of how religious, economic, political and other social institutions shape values in our society, and what impact society's changing values are having upon marriage and the family.
Prereq: At least two social science courses
Cross-listed as ISS 350H

SOCWK 355R F,W,S,J 3C 0.5 Child Maltreatment: Identification and Prevention
The objectives of this course are to provide an understanding of the dimensions and causes of child maltreatment, to develop skills identifying cases of this social problem and to explore current methods of management and treatment of persons involved in child maltreatment situations.
Prereq: SOCWK 120R or consent of instructor

SOCWK 356R F 3C 0.5 Mental Retardation and the Family
A critical application of social work theory to real situations involving the social, emotional and physical functioning of the family that has a mentally retarded member. Will also include consideration of the impact of current social policies.
Prereq: SOCWK 120R or consent of instructor

SOCWK 357R W,J 3C 0.5 Family Violence
An application of the principles and models of medical, psychogenic, and sociogenic adjustment to an understanding of family violence. The treatment of victims of family violence, the prevention of such violence, and social policies affecting family welfare are considered.
Prereq: SOCWK 120R or consent of instructor

SOCWK 357R W 3C 0.5 Social Work with the Elderly
An examination of social work theory and practice concerning the needs of the elderly. Social work strategies of intervention with the healthy and frail aged will be considered from the individual, group, family, community, and bureaucratic perspectives.
Prereq: SOCWK 120R or consent of instructor

SOCWK 360A/B J,J 3C/3C 0.5 Family Violence: An Advanced Seminar
Social Work concepts and practices introduced in preceding family violence courses will be considered in depth. Over the course of two terms a seminar format will be used to explore etiological and intervention issues pertaining to the various forms of family violence.
Prereq: SOCWK 355R and 357R or consent of instructor
A letter grade for SOCWK 360A will be submitted only after the completion of SOCWK 360B

SOCWK 390R F 3C 0.5 Social Work: Perspectives and Processes
The deviance-making process is examined in a variety of social contexts. Examines the emergence of rules and control agencies, the processes by which persons become involved in deviant activities, and the contingencies affecting their careers as deviants.
Prereq: An introductory Sociology course or consent of instructor

SOC 120R W 3C 0.5 The Sociology of Physical Disability
Examination of the social adaptations of the physically disabled. Particular attention is given to the theoretical tradition which considers physical disability as a form of involuntary deviance which stigmatizes the individual.
Prereq: An introductory Sociology course

SOC 369R F 3C 0.5 Custodial and Rehabilitative Institutions
"Total institutions" are concerned with resocialization of "inmates". This course considers the structure of maximum security prisons, mental hospitals, isolated work environments and concentration camps, emphasizing their philosophies, their organization, their goals, and their effectiveness in modifying and controlling behaviour.
Prereq: An introductory Sociology course

SOC 396R F 3C 0.5 Independent Study
An independent in-depth study of a selected area of concern to the student within the discipline of Social Work. Available to individuals or small groups of third or fourth year Social Development Studies students and arranged with one of the faculty members.
Prereq: Permission of Undergraduate Officer

SOC 397R W,S 3C 0.5 Fundamentals of Sociology
An examination of the fundamental concepts of Sociology and their application in seeking to understand the changing patterns and life-styles taking place specifically in Canada, and in general, within North American society.
Students may receive credit for only one of SOC 120R or SOC 101

SOC 223 F 3C 0.5 Deviance: Perspectives and Processes
The deviance-making process is examined in a variety of social contexts. Examines the emergence of rules and control agencies, the processes by which persons become involved in deviant activities, and the contingencies affecting their careers as deviants.
Prereq: An introductory Sociology course or consent of instructor

SOC 367R F 3C 0.5 Social Work: Perspectives and Processes
The deviance-making process is examined in a variety of social contexts. Examines the emergence of rules and control agencies, the processes by which persons become involved in deviant activities, and the contingencies affecting their careers as deviants.
Prereq: An introductory Sociology course

Social Development Studies

Sociology

SOC 120R W 3C 0.5 Fundamentals of Sociology
An examination of the fundamental concepts of Sociology and their application in seeking to understand the changing patterns and lifestyles taking place specifically in Canada, and in general, within North American society. Students may receive credit for only one of SOC 120R or SOC 101

SOC 390R/399R F,W,S R 0.5/0.5 Independent Study
An independent in-depth study of a selected area of concern to the student within the discipline of Sociology. Available to individuals or small groups of third or fourth year Social Development Studies majors and arranged with one of the faculty members.
Prereq: Permission of Undergraduate Officer

SOCIOLOGY

SOC 368R F 3C 0.5 The Sociology of Physical Disability
Examination of the social adaptations of the physically disabled. Particular attention is given to the theoretical tradition which considers physical disability as a form of involuntary deviance which stigmatizes the individual.
Prereq: An introductory Sociology course

SOC 369R F 3C 0.5 Custodial and Rehabilitative Institutions
"Total institutions" are concerned with resocialization of "inmates". This course considers the structure of maximum security prisons, mental hospitals, isolated work environments and concentration camps, emphasizing their philosophies, their organization, their goals, and their effectiveness in modifying and controlling behaviour.
Prereq: An introductory Sociology course

SOC 396R F 3C 0.5 Independent Study
An independent in-depth study of a selected area of concern to the student within the discipline of Sociology. Available to individuals or small groups of third or fourth year Social Development Studies majors and arranged with one of the faculty members.
Prereq: Permission of Undergraduate Officer
COURSES NOT OFFERED 1991-92

ISS 231R Social Ideas, Social Policy and Political Practice 2
ISS 350C Children in Difficulty: Biosocial Perspectives
ISS 350F Values in the Social Sciences
ISS 350I Individualism and the Family Life Cycle
PSYCH 220R Social Psychology
PSYCH 221R Interpersonal Interaction
PSYCH 369R Advanced Topics in Counselling Psychology
SOC 220R The Individual, Society and Religion
SOC 221R Master Trends in Modern Society
SOC 327R Minority Status in Canadian Society
SOC 328R Canadian Ethnic and Cultural Minorities
SOCWK 121R Contemporary Social Problems

Social Work

For courses in Social Work see Social Development Studies.

Society, Technology and Values

Undergraduate Officer
D.B. Huron, MC 4049, ext. 6215

STV 100 W,S 0.5
Society, Technology and Values: Introduction
This course examines the interaction of the technologies developed by a culture with the values and social organization of that culture. The course exposes students to various definitions of society, technology and values, and it presents alternative views about how the three interact. These views are then applied to a number of spheres of influence, including patterns of employment and the role of work; medicine and health; polity and economy; sustainable development and the environment.
Prereq: None

STV 200 F,W,S 0.5
Society, Technology and Values: Group Projects
This course provides students with an opportunity to apply concepts covered in STV 100 to the analysis of a specific problem area. The course is organized as a group-oriented project or exercise on a theme chosen by the instructor. The theme may focus on a particular technology in its societal context, or on a commonly held value and its interaction with one or more technologies. Recent STV 200 themes have included cultural dimensions of educational computing, technology and the city, human beauty, and professionals and social responsibility.
Prereq: STV 100 or instructor's consent

STV 201A-Z 0.5
Society, Technology and Values: Special Topics
Study of the interaction of society, technology and values in a particular topic area under tutorial guidance by visiting or adjunct faculty.
Prereq: STV 100 or instructor's consent

STV 400 F,W,S 0.5
Society, Technology and Values: Senior Project
An independent, supervised research project related to the interaction of society, technology and values. Projects may take any format that demonstrates scholarly merit. Formats may include essays, impact studies, designs, computer software, or other media. Students are responsible for proposing suitable projects and are encouraged to seek faculty advice on plausible topics.
Prereq: STV 109 and registration in the STV Option, normally at the fourth-year level

STV 401A-Z 0.5
Society, Technology and Values: Advanced Topics
Advanced study of the interaction of society, technology and values in a particular topic area under tutorial guidance by visiting or adjunct faculty.
Prereq: STV 100 or instructor's consent

Sociology

Undergraduate Officer
R. Hiscott, PAS 2060, ext. 2645

Courses not offered in the current academic year are listed at the end of this section.

SOC 101 F,W,S 2C 0.5
Introduction to Sociology
An introduction to the basic concepts and frames of reference of sociological investigation and interpretation. Topics for analysis will include communities, associations and institutions, classes and status groups, crowds and publics, social processes, and social change. Special attention is given to Canadian society.
Not open to students who have taken SOC 101(4), 101(m),101(u) or SOC 120R. 101(m) is an introductory course intended as an elective for mathematics students or as a basis for a combined honours in Mathematics and Sociology. 101(u) is especially designed for Planning students.
Also offered at Conrad Grebel, Renison and St. Jerome's Colleges.
SOC 102 2C 0.5
Social Problems
An examination of cultural forces that create social problems and failures in personal and institutional adjustments. Specific attention is paid to the problems of poverty, delinquency and ethnic relations in Canadian society.

SOC 200 W 2C 0.5
Marriage and the Family
A survey of sociological perspectives on marriage and the family in urban-industrial societies. Special attention is given to marriage and the family in Canada. Comparisons with U.S and Britain will be undertaken.
Prereq: SOC 101 or consent of instructor
Also offered at St. Jerome's College.

SOC 204 2C 0.5
Sociology of Adolescence
The social definitions of adolescence in cross-cultural and historical perspectives. Social roles of adolescents in the institutional structures of urban-industrial societies with special emphasis on the family, education, and the economy. The relationship of adolescents' social roles to processes of social change and stability.
Prereq: SOC 101 or consent of instructor

SOC 206 2C 0.5
Gender Relations
An examination of gender relations in Canadian society, including historical changes and the contemporary situation. Emphasis is placed on a consideration of the social construction of gender, the gender structure of institutions and gender inequality. The course also examines selected issues in contemporary gender relations.
Prereq: SOC 101 or consent of instructor

SOC 207 S,F,S 2C 0.5
Sociology of Education
Attention will be focused on the concepts and theories of sociology as they apply especially to the educational system. This course is designed for Co-op and Regular students who plan to enter the teaching field.
Prereq: SOC 101 or consent of instructor
Offered at Conrad Grebel College.

SOC 209 S 2C 0.5
Family Origin and Personal Identity
This course focuses on the intersection of biography and social structure within the family. Application of sociological theory and methods to students' own family backgrounds will be used to illustrate the social bases of identity.
Prereq: SOC 101 or consent of instructor
Also offered at St. Jerome's College

SOC 214 2C 0.5
Class, Status and Power
Analysis of social classes in society, including their basis for development, composition and consequences for society. Special attention is given to social stratification in Canada.
Prereq: SOC 101 or consent of instructor

SOC 216 2C 0.5
Language, Society, and Identity
A sociology of language is provided with particular reference to the relationship between language, (Canadian) society, and identity. Included are various sociolinguistic issues such as the role of language in shaping the (re)construction of diverse realities.

SOC 219 2C 0.5
Canadian Society
An introductory survey of Canadian society. This course will examine issues in the socio-historical development of Canadian society, its present social structure, organizations and ideologies.
Prereq: SOC 101 or consent of instructor

SOC 221 2C 0.5
Juvenile Delinquency
A systematic analysis and criticism is presented of biological, psychological, psychoanalytical and sociological theories of juvenile delinquency. Attention is given to statistics and contemporary research with special emphasis on the distribution and types of delinquent subcultures.
Prereq: SOC 101 or consent of instructor

SOC 223 F 2C 0.5
Deviance: Perspectives and Processes
The deviance-making process is examined in a variety of social contexts. Examines the emergence of rules and control agencies, the processes by which people become involved in deviant activities, and the contingencies affecting their careers as deviants.
Prereq: SOC 101 or consent of instructor
Also offered at Renison College.

SOC 227 2C 0.5
Criminology
An analysis and criticism of the major theories of criminal behaviour. Emphasis is given to the relationship between social structure and criminal behaviour; types of criminal behaviour such as drug addiction, burglary and homicide in contemporary society. Special attention is given to Canadian data.
Prereq: SOC 101 or consent of instructor

SOC 228 2C 0.5
Juvenile Justice
An examination of theories of juvenile justice, juvenile law, and the structure and operations of juvenile systems, especially in Canada.
Prereq: SOC 222 or consent of instructor

SOC 232 2C 0.5
Law and Order: Regulating Deviance
Focusing on the "processes and problems of social control", this course examines: the conditions affecting the emergence of legal norms; the enforcement of criminal law; and the processing of offenders.
Prereq: SOC 101 or consent of instructor

SOC 233 2C 0.5
Technology and Social Change
This course relates the prospect of social change to issues such as the division of labour, automation, technology and ecology, "post-industrial" society, small scale technology, workers' control and the domination of nature.
Prereq: SOC 101
### Course Descriptions

#### Sociology

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Credits</th>
<th>Title</th>
<th>Prerequisites</th>
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</thead>
<tbody>
<tr>
<td>SOC 233</td>
<td>2C</td>
<td>Social Psychology of Beliefs and Attitudes</td>
<td>Prereq: SOC 101 or PSYCH 101 or consent of instructor</td>
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<td>Examines the sources, organization and distribution of beliefs and attitudes and their significance for the individual and society.</td>
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<tr>
<td>SOC 234</td>
<td>2C</td>
<td>Social Psychology and Everyday Life</td>
<td>Prereq: SOC 101 or consent of instructor</td>
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<td>Introducing students to symbolic interaction, a sociological social psychology, this course examines: the impact of culture on socialization experiences; the development of self-identities and social reputations; and interaction patterns in a variety of casual, occupational and deviance contexts.</td>
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<tr>
<td>SOC 236</td>
<td>2C</td>
<td>Social Movements</td>
<td>Prereq: SOC 101 or consent of instructor</td>
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<td>The analysis of varieties of social movements and their relationships to social organization and social change.</td>
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<tr>
<td>SOC 237</td>
<td>2C</td>
<td>Collective Behaviour</td>
<td>Prereq: SOC 101 or consent of instructor</td>
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<td></td>
<td>The sociological analysis of the behaviour of crowds, mobs, publics and related phenomena and their relationships to social organization and social change.</td>
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<tr>
<td>SOC 238</td>
<td>2C</td>
<td>Sociology of Marketing and Sales</td>
<td>Prereq: SOC 101 or consent of instructor</td>
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<td>This course considers the (social) processes by which people &quot;do business&quot;. Focusing on day to day exchanges, ongoing relationships within the business and consumer community are examined from an interactionist perspective.</td>
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<tr>
<td>SOC 241</td>
<td>3C</td>
<td>Introduction to the Sociology of Work</td>
<td>Prereq: SOC 101 or consent of instructor</td>
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<td>A survey of the changing nature and ideology of work, as well as the impact of different kinds of work organizations on other institutions and on individual works. Canadian emphasis but some comparative material included. Examines the relationship between formal and domestic economies. Some discussion of alternative forms of work (co-ops, industrial democracy).</td>
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<tr>
<td>SOC 242</td>
<td>2C</td>
<td>Industrial Sociology</td>
<td>Prereq: SOC 101 or consent of instructor</td>
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<td>Special emphasis is given in lectures, reading and assignments to the particular problems facing industrial Canada, especially in reference to regionalism, elitism, the multinational enterprise and the problem of foreign ownership.</td>
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<tr>
<td>SOC 243</td>
<td>2C</td>
<td>Occupational Sociology</td>
<td>Prereq: SOC 101 or consent of instructor</td>
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<td>An introduction to the study of work and occupations; the problems of occupational choice, occupational socialization and identification; the concepts of career and career mobility; the professionalization process, the nature of professions; the impact of occupation on life styles, leisure and retirement.</td>
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<tr>
<td>SOC 245</td>
<td>2C</td>
<td>Interpersonal Communication</td>
<td>Prereq: SOC 101 or consent of instructor</td>
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<td>An introduction to the process and functions of communication in dyadic or small group settings. Emphasis is directed toward increasing student understanding of communication in face-to-face contexts.</td>
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<tr>
<td>SOC 246</td>
<td>2C</td>
<td>Mass Communication</td>
<td>Prereq: SOC 101 or consent of instructor</td>
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<td>This course provides an introduction to the social processes and functions of mass media communication - with particular reference to the Canadian context. Emphasis is focused on the relationship between mass communication and the ongoing reconstruction of social reality.</td>
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<tr>
<td>SOC 247</td>
<td>2C</td>
<td>Death and Society</td>
<td>Prereq: SOC 101 or consent of instructor</td>
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<td>The course deals with the current literature on death and dying. Patterns of mortality as affecting different social groups and as reflecting differential life chances of individuals in society are described. North American issues of death and dying are considered against an historical background.</td>
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<tr>
<td>SOC 248</td>
<td>2C</td>
<td>Health, Illness and Society</td>
<td>Prereq: SOC 101 or consent of instructor</td>
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<td>This course focuses on the social aspects of health and illness, including social causes of illness, the social process of becoming ill, and the social consequences of being defined as ill.</td>
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<tr>
<td>SOC 249</td>
<td>W 3C</td>
<td>Sociology of Mental Disorders</td>
<td>Prereq: SOC 101 or permission of the instructor</td>
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<td>Sociology of Mental Disorders: Examining the sources, distribution of beliefs and attitudes and their significance for the individual and society.</td>
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<tr>
<td>SOC 252</td>
<td>2C</td>
<td>Migration and Society</td>
<td>Prereq: SOC 101 or consent of instructor</td>
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<td>An overview of international migration, particularly during this century; a survey of statistical sources and theoretical explanations of migration. A section of the course will be on the history of immigration to Canada, migration within Canada, and Canadian immigration policies in the context of world migration.</td>
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<tr>
<td>SOC 253</td>
<td>2C</td>
<td>Population in Canadian Society</td>
<td>Prereq: SOC 101 or consent of instructor</td>
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<td>Study of the basic demographic processes in the population of Canada. Demographic implications for selected social institutions. Use of Canadian enumeration and registration data.</td>
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<tr>
<td>SOC 254</td>
<td>2C</td>
<td>Comparative Social Structure</td>
<td>Prereq: SOC 101 or consent of instructor</td>
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<td>General theoretical and methodological issues facing comparative sociology: comparative methods at work in the treatment of Western and non-Western societies (including Canada).</td>
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<tr>
<td>SOC 256</td>
<td>W 2C</td>
<td>Ethnic and Racial Relations</td>
<td>Prereq: SOC 101 or consent of instructor</td>
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<td>Relations between different racial and cultural groups, analysis of majority-minority group status with special reference to Canada.</td>
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</tbody>
</table>
SOC 263 W 3C 0.5
Sects, Cults and New Religious Movements
An analysis of minority religions considered deviant by the dominant society such as the Amish, Mormons, and Jehovah's Witnesses, with special consideration of the recent new religious movements including Unification (Moonies), Scientology and Krishna consciousness.

Cross-listed as R S 221
Offered at Conrad Grebel College.

SOC 264 2C 0.5
Sociology of Religion
Religion is defined broadly and its relation to phenomena like totalitarian movements, psychoanalysis and drug experience examined. The features common to all religions are explained, viz myth, dogma, church, ritual, ethics and religious experience.

Prereq: SOC 101 or consent of instructor

SOC 265 2C 0.5
Political Sociology
The sociological analysis of the institutionalization of power, political movements, parties, conflict and its accommodation.

Prereq: SOC 101 or consent of instructor

SOC 267 2C 0.5
Sociology of the Contemporary University
How have recent demographic and economic changes in North America affected the organization and goals of higher learning? This course explores organizational crises and various attempts at containing and managing them.

Prereq: SOC 101 or consent of instructor

SOC 275 F,W 0.5
The Mennonites as a Sociological Community
An analysis of the Mennonites as a social movement, their transition to a sectarian community, transformation to a religious-ethnic society, and present pluralistic profile. Case studies of and field visits to area Mennonites included.

Offered at Conrad Grebel College

SOC 280 F,W 2C,2L 0.5
Social Statistics
A basic course in sociological statistics, sampling, central tendency, probability, covariance, as illustrated in specifically sociological data.

Prereq: SOC 101 or consent of instructor
See overlapping content note (Grading Systems, item 7) on page 9:7

SOC 281 0.5
Fundamentals of Sociological Research
A basic introduction to sociological research methods. Theory construction, epistemological issues, measurement, sampling, experimentation, surveys, naturalistic inquiry, research design, data analysis. Recommended for three year, General sociology students.

Prereq: SOC 101 or consent of instructor
See overlapping content note (Grading Systems, item 7) on page 9:7

SOC 286 2C 0.5
Environment and Behaviour
A study of the interaction between social organization and ecological factors such as pollution, energy and land resources.

SOC 290 F,W 0.5
Sociology of Community
Using communes and the writings of utopian visionaries as case studies, the nature and definition of community, the place and problem of community in modern societies, and the function of community in local and worldwide societal harmony will be analyzed.

Offered at Conrad Grebel College

SOC 305 2C 0.5
Introductory Sociological Theory
An examination of the object and function of sociological theory in social research. Types of sociological theories, discussion of selected classics of sociological theory.

Prereq: SOC 101 or consent of instructor

SOC 307 W 2C 0.5
Problems in Contemporary Education
A study of problems arising from the interplay between institutionalized education and the forces of rapid social change in the contemporary society. It emphasizes the changing roles of the learners and instructors and social dimensions of new learning theories and programs. Themes will be selected and studied in depth on a seminar basis.

Prereq: SOC 101 or consent of instructor

SOC 310 S 2S 0.5
Seminar in Group Dynamics
An analysis of naturally occurring and experimental group from a social structural perspective. The study of processes of internal differentiation, integration, authority, etc; and the relationships between small groups and their environments.

Prereq: SOC 101 or consent of instructor

SOC 321 F,W C 0.5
Methods 1
An introductory survey of the research techniques employed by sociologists. The formulation of research designs appropriate to various kinds of intellectual problems in social science is stressed.

Prereq: SOC 101 and SOC 280 or consent of instructor
See overlapping content note (Grading Systems, item 7) on page 9:7

SOC 322 W 2C 0.5
Methods 2
Continuation of Methods 1. The course involves seminar meetings emphasizing the critical evaluation of research techniques.

Prereq: SOC 280 and SOC 321 or consent of instructor

SOC 328 3C 0.5
Sentencing as a Social Process
Examines in depth the process and results of criminal sentencing. Topics include types of sentences for criminal and quasi-criminal offences; objectives of sentences; factors affecting sentences; the process of sentencing; the administration and effectiveness of sentences; and unresolved debates in sentencing.

Prereq: SOC 101 and one course in the 220 series or permission of instructor
SOC 329 2C 0.5
Crime as Business
Examinos the inter relacionoh of crime and business, looking not only at the extent to which (1) crime represents business for its practitioners and (2) the criminal activities of legitimate business people, but also (3) the agencies regulating crime.
Prereq: SOC 101 and 1 Sociology course in the 220 series

SOC 333 2C 0.5
Canadian Multiculturalism
A seminar dealing with multicultural attitudes and beliefs in Canadian society, especially within the majority English and French Canadian populations.
Prereq: An introductory course in a Social Science

SOC 336 2C 0.5
Sociology of Professions
An examination of the distinctive nature of professions; professional recruitment, socialization and identification; professional careers; the professionalization of occupations; relationship to government; professional specialization; status, power and mobility of professionals.
Prereq: SOC 101

SOC 340 2C 0.5
Complex Organizations
Examines the role of large-scale organizations in industrial society, and their impact and influence. Illustrations will be drawn from commerce and industry, as well as education, health services, and government.
Prereq: SOC 101

SOC 342 2C 0.5
Sociology of Industrial Relations
Using sociological concepts and theories, the course will examine the nature of the relationship between employers and employees, current issues facing unions and management, and the character of accommodation which may be realized between the two.
Prereq: SOC 101 and SOC 242

SOC 343 2C 0.5
Sociology of Health Care
Examination of the organizations which provide health care, including assumptions under which they operate, interactive roles played by all members, including patients, alternative arrangements for providing health care, and the social positions held by health professionals.
Prereq: SOC 101 or consent of instructor

SOC 344 3C 0.5
Sociology of Aging
An introduction to individual and population aging. Topics discussed include: aging from an historical and comparative perspective; aging in subcultures; aging and the social structure; aging and social processes; aging and the environment; work and retirement; and aging and leisure patterns.
Prereq: SOC 101 and 1 other Sociology course
Cross-listed as KIN 352

SOC 347 3C 0.5
Sociology of Leisure
Nature and extent of leisure phenomena in contemporary society. Examination of institutional and formal organization aspects, social role, social research strategies employed in the study of leisure.
Prereq: Two term courses in sociology
Cross-listed as REC 201

SOC 354 2C 0.5
World Population Problems
Comparative analysis of population problems across societies. Focus is on social institutions and their relationships to population. Emphasis on fertility and family planning.
Prereq: SOC 101 and SOC 253

SOC 364 W 2C 0.5
Social Change
A systematic review and analysis of sources, patterns, processes, and consequences of social change in developing countries, the role of ideas, and the breakdown and reorganization of social structure.
Prereq: SOC 101 and one other Sociology course
Also offered at St. Jerome’s College

SOC 366 2C 0.5
Urban Sociology
The comparative study of urbanization as a process; the culture and organization of cities, urban problems; special attention is given to industrial cities of Canada, with comparative reference to the principal cities of Western societies.
Prereq: SOC 101 and one other Sociology course

SOC 370 W 2C 0.5
Sociology of Law
Special attention will be paid to the growing public awareness of the failure of law to provide justice or social control in a number of situations. Local judges, lawyers and police officials are invited to discuss such issues as the jury system, police and violence, civil rights and mass media.
Prereq: Third-year standing or by permission
Offered at Conrad Grebel College.

SOC 371 3C 0.5
Philosophy of Social Science
Problems about the fundamental methods and aims of the social sciences generally, the problems specific to Psychology, Sociology, Political Science, etc., and their relations to one another will be considered.
Prereq: Some previous work in a Social Science or in Philosophy
Cross-listed as PHIL 362

SOC 378 3C 0.5
Sociology of Women
An examination of the growing sociological literature on women’s roles, experiences, realities, problems and challenges. Particular emphasis is placed on critiques of traditional sociological theory and methodology and the emergence of new theories and methodologies which better reflect women’s experiences.
Prereq: SOC 101 and 206, or consent of instructor

SOC 382 3C 0.5
Survey Methodology
The design of sample surveys. Survey procedures from the conceptual level through sampling, measurement, questionnaire design, administration and analysis of responses are illustrated within the context of practical examples and student projects.

SOC 401 0.5
Theoretical Perspectives on Gender
An examination of sociological theories of gender and gender relations. Emphasis is placed on tracing historical changes in interpretations of gender, with a particular consideration of contemporary theoretical debates. Approaches to be considered include feminist theories as well as political economy and cultural studies.
Prereq: SOC 101 and SOC 206 or consent of instructor
SOC 405 2C 0.5
The Development of Sociological Theory
Development of sociological theory in the 19th and early 20th centuries. Emphasis is on the European tradition, although selective attention is given to North American theorists.
Prereq: SOC 101 and one other Sociology course (SOC 305 is recommended)

SOC 406 2C 0.5
Contemporary Sociological Theory
Development of sociological theory in the 20th century. Included is discussion of current theoretical work.
Prereq: SOC 101 and one other Sociology course (SOC 305 is recommended)

SOC 410 2C 0.5
Qualitative Methods: Field Research
An application of symbolic interactionist theory, this course examines the contingencies affecting data collection and analysis of ongoing group life. While doing field work, students have an opportunity to examine basic features of interactionist thought.
Prereq: SOC 101
Formerly SOC 380

SOC 411 2C 0.5
Sociological Inquiry
This course gives students practical experience in the formulation and execution of research questions. Emphasis is on integrating theory into research. A seminar format tailors the course to student interests, allowing students to work out research ideas using feedback from the seminar. The class assignment will allow for rewriting and modification and could be used as the basis of honours essays, graduate work or preparation for employment.

SOC 415 2C 0.5
Social Networks
A survey of applications of the concept of the network in studying social structures. Examples will be drawn from diverse areas, such as interpersonal relations, community studies, social support, interorganizational relations, elites, deviant groups, etc.
Prereq: SOC 101 or consent of instructor

SOC 421 2C 0.5
Quantitative Methods
Design and data analysis in contemporary sociological research, with an emphasis on the analysis of secondary data and computer applications.
Prereq: SOC 280 or equivalent or consent of instructor
Formerly SOC 381

SOC 430 0.5
Political Participation
An examination of the social psychological foundations of Canadian participation, broadly conceived, in the political system.
Prereq: Third- or fourth-year social science or consent of instructor

SOC 440A-X S,F,W 0.5
Directed Readings
Selected readings and essay assignments under the direction of a faculty member.
Prereq: Fourth-year standing in Sociology

SOC 440A F,W,S 0.5
Directed Readings in Deviance, Criminology, and Corrections.

SOC 440B F,W,S 0.5
Directed Readings in Social Psychology

SOC 440C F,W,S 0.5
Directed Readings in Social Inequality

SOC 440D F,W,S, 0.5
Directed Readings in Quantitative Methods and Statistics

SOC 440E F,W,S, 0.5
Directed Readings in Social theory

SOC 440H F,W,S 0.5
Directed Readings in the Family

SOC 440J F,W,S 0.5
Directed Readings in the Marketplace

SOC 440K F,W,S, 0.5
Directed Readings in Industry, Work and Complex Organizations

SOC 440M F,W,S, 0.5
Directed Readings in Religion

SOC 440N F,W,S 0.5
Directed Readings in Demography

SOC 440P F,W,S 0.5
Directed Readings in Developing Nations
Spanish

Undergraduate Officer
M. Gutiérrez, ML 209, ext. 3658

Courses not offered in the current academic year are listed at the end of this section.

Students with a knowledge of Spanish not acquired in an academic institution must write a placement test before registering in a language course.

SPAN 101 F,W 3C,1L 0.5
Introduction to Spanish 1
Intensive drill in the fundamentals of grammar, comprehension and speaking. Some reading, translation and composition. The language laboratory is used as an integral part of the course.

For students with no previous knowledge of Spanish. Cannot be taken concurrently with SPAN 111.

(WLU 101/151-40).

SPAN 102 F,W 3C,1L 0.5
Introduction to Spanish 2
A continuation of SPAN 101.
Prereq: SPAN 101 or consent of the Department
(WLU 101/152-40).

SPAN 201A F 3C,1L 0.5
Intermediate Spanish 1
For students with some knowledge of Spanish. Seeks to reinforce the language, both oral and written, through selected texts and grammar review. Language laboratory also used to increase understanding and speaking skills.
Prereq: SPAN 102 or consent of the Department
(WLU 121/171-30).

SPAN 201B W 3C,1L 0.5
Intermediate Spanish 2
A continuation of SPAN 201A
Prereq: SPAN 201A or consent of the Department
(WLU 122/172-03).

SPAN 204 W 3C 0.5
Spanish Civilization 2
A continuation of SPAN 203.
Offered at WLU Taught in English.
(WLU 213/263-03)

SPAN 205 F 3C 0.5
Survey of Spanish Literature 1
Readings of major authors and study of the main literary trends from the Middle Ages to the 18th century.
Offered at WLU
Prereq: SPAN 201B
(WLU 205/255-30).

SPAN 206 W 3C 0.5
Survey of Spanish Literature 2
A continuation of SPAN 205 from the 18th century to the present.
Offered at WLU
Prereq: SPAN 206
(WLU 206/256-03).

SPAN 217 F 3C 0.5
Latin American Civilization 1
A survey of the geography, history and problems of Latin America from pre-Columbian times to the present.
Taught in English.
(WLU 223/273-30).

SPAN 218 W 3C 0.5
Latin American Civilization 2
A survey of the literature, art and music of Latin America from pre-Columbian times to the present.
Taught in English.
(WLU 223/283-03).

SPAN 227 F 3C 0.5
Survey of Latin American Literature 1
This course is an introduction to Latin American literature and will cover the most significant works from the conquest to the 19th century. The course also aims to introduce the student to literary analysis and, therefore, particular attention will be paid to the question of genre, terminology, literary movements and textual analysis.
Prereq: SPAN 201B
(WLU 208/258-30).

SPAN 228 W 3C 0.5
Survey of Latin American Literature 2
This course is a continuation of SPAN 227 and will study the period beginning with Modernismo (c. 1880) to the present day. Works of such renowned authors as Neruda, Borges and Garcia Márquez will form part of the material taught in this course. The approach will be similar to SPAN 227 with special emphasis on textual analysis.
Prereq: SPAN 227
(WLU 209/259-03).

SPAN 251A F 3C 0.5
Composition and Conversation 1
Intensive language study with the following objectives: to reinforce the study of oral and grammatical skills, with emphasis on creative compositions, oral presentations, class discussions and skilful translations.
Prereq: SPAN 218 or consent of the Department
(WLU 211/261-30).

SPAN 251B W 3C 0.5
Composition and Conversation 2
A continuation of SPAN 251A.
Prereq: SPAN 251A
(WLU 212/262-03).

SPAN 255 F 3C 0.5
The Spanish Short Story
Selected stories from outstanding writers in Spain, primarily of the 20th century. The chosen authors are representative of the most significant literary movements of the 19th and 20th centuries. Among the authors studied are V. Blasco Ibáñez, Miguel de Unamuno, Pio Baroja, Azorín, Gabriel Miró, Camilo José Cela, Carmen Laforet, Miguel Delibes, Ignacio Aldecoa, Ana María Matute, Carmen Martín Gaite, Max Aub.
(WLU 204/254-3).

SPAN 266 W 3C 0.5
The Latin American Short Story
A study of selected stories by Latin American writers. The chosen stories are part of a literature in which the themes of "magical-realism", exile, national identity, history, metaphysical fantasy and social struggle never stop flourishing. Some of the authors studied in this course are Juan Rulfo, Jorge L. Borges, Carlos Fuentes, G. García Márquez, Isabel Allende.
(WLU 214/264-03).

SPAN 322 F 2C 0.5
The Generation of '98: Fiction
A study of selected works of Valle Inclán, Azorín, Baroja and Unamuno.
Prereq: SPAN 206
(WLU 322/372).

SPAN 327 F 2C 0.5
The Spanish Golden Age: Don Quijote
A literary analysis of Don Quijote through diverse criticism of the masterpiece.
Offered at WLU
Prereq: SPAN 206
(WLU 327/477).
**SPAN 334 F 2C 0.5 Modern Latin American Prose**

An in-depth study of selected prose masterpieces from Sarmiento to the 1930's. The political, social and cultural and educational motifs will be analyzed in detail. The question of the novel as a vehicle for social conscientization will also be studied.  
(WLU 308/358)

**SPAN 344 F,W 2T 0.5 Special Topics in Hispanic Studies**

By special arrangements, an individual student or a small group of students will follow a course of study under the supervision of a faculty member.  
(WLU 317/467/20)

**SPAN 351A F 2C 0.5 Advanced Composition and Conversation 1**

Writing of essays and discussion based on selected themes or topics relating to Spain or Spanish America.  
Prereq: SPAN 251B  
(WLU 301/351-20)

**SPAN 351B W 2C 0.5 Advanced Composition and Conversation 2**

A continuation of SPAN 351A.  
Prereq: SPAN 351A  
(WLU 302/352-02)

**SPAN 497 W 2C 0.5 The Novel in Latin America**

A study of the 20th century novel and its development from the 1930's to the present through representative authors. While special attention will be paid to the esthetic achievements of the Latin American novel in the last half century, the individual works will be analyzed for their value as the expression of social and historical reality.  
Prereq: SPAN 228 or consent of the Department  
(WLU 329/479-20)

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**COURSES NOT OFFERED 1991-92**

**SPAN 304 Romanticism in Spain**  
**SPAN 305 The Spanish Realist Novel**  
**SPAN 311A Applied Spanish Stylistics 1**  
**SPAN 311B Applied Spanish Stylistics 2**  
**SPAN 324 Contemporary Spanish Theatre and Poetry**  
**SPAN 325 Contemporary Spanish Novel**  
**SPAN 326 The Spanish Golden Age: Theatre and Poetry**  
**SPAN 331 Contemporary Spanish Essay**  
**SPAN 333 Modern Latin American Poetry**

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**SPAN 387 Latin American Women Writers**

**SPAN 388 Contemporary Spanish American Theatre**

**SPAN 445 History of the Spanish Language**

**SPAN 446 Medieval Spanish Literature**

**SPAN 495 The Novel in Mexico**

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**Statistics**

Undergraduate Officer
J.C. Robinson, MC 6030, ext. 4493

Courses not offered in the current academic year are listed at the end of this section.

**Introductory Notes**

1. The following courses are offered in conjunction with the Division of Mathematics for Industry and Commerce: STAT 331, 332, 333, 335, 371, 443

2. More detailed course descriptions and course outlines are available in the Statistics Undergraduate Studies Handbook.

**STAT 202 F 2C,1L 0.5 Elementary Statistics for Biologists**

Elementary probability, populations, sample and distributions with biological examples. Methods for data summary and presentation. Estimation, hypothesis testing, two-sample techniques and paired comparisons, regression, correlation.

For Science students only.

**STAT 204 F 2C,1L 0.5 Statistics for the Physical Sciences 1**

Descriptive statistics. Probability, random variables, discrete and continuous distributions. Estimation and hypothesis testing, regression, correlation.

For Science students only.

**STAT 211 F,S 3C,1T 0.5 Introductory Statistics and Sampling for Accounting**

Descriptive statistics, probability, discrete and continuous random variables. Sampling distributions and simple hypothesis testing. Introduction to survey sampling.  
Prereq: MATH 111B, 113A  
Open only to students from the School of Accountancy

**STAT 220 F 3C,1T 0.5 Introduction to Statistical Methods 1**

Introduction to design of experiments; descriptive statistics (histograms, summary statistics, stem and leaf plots, correlation); probability (the normal and binomial distributions, other continuous and discrete distributions); chance variability (linear combinations of random variables, the central limit theorem).  
Prereq: MATH 113B or equivalent  
Not open to Honours Mathematics students.

Antireq: STAT 230, 240

**STAT 221 W 3C,1T 0.5 Introduction to Statistical Methods 2**

Chance models (applied to measurement error and genetics); tests of significance (one- and two-sample z- and t-tests); simple linear regression (including analysis of variance and parameter estimation); survey sampling (including estimation of means, totals and proportions in simple random sampling).

Prereq: STAT 220  
Not open to Honours Mathematics students.

Antireq: STAT 231, 241

**STAT 230 F,W,S 3C,1T 0.5 Probability**

The laws of probability, discrete and continuous random variables, expectation, central limit theorem.

Prereq: MATH 130B, or MATH 137 and second-year standing  
Also offered at St. Jerome's College in the Fall term.

Antireq: STAT 220

**STAT 231 F,W,S 3C,1T 0.5 Statistics**

Estimation, tests of significance, probability plots. Contingency tables, normal distribution theory, simple linear regression.

Prereq: MATH 230A or 237, and STAT 220

Antireq: STAT 221, 241  
Also offered at St. Jerome's College in the Winter term.

**STAT 240 F,W 3C 0.5 Probability**

STAT 240 is an advanced-level enriched version of STAT 230.  
Prereq: MATH 130B or 138  
Antireq: STAT 220

**STAT 241 W,S 3C 0.5 Statistics**

STAT 241 is an advanced-level enriched version of STAT 231.  
Prereq: MATH 230A or 237, and STAT 230  
Antireq: STAT 221, 231
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>Credits</th>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT 304</td>
<td>Statistics for the Physical Sciences 2</td>
<td>0.5</td>
<td>普 Lag regression. Introduction to the design of experiments. Completely randomized and randomized block designs. Analysis of variance. Prereq: STAT 202 or 204 For Science students only.</td>
</tr>
<tr>
<td>STAT 311</td>
<td>Regression and Forecasting for Accounting</td>
<td>0.5</td>
<td>Review of summary statistics and tests of hypothesis. Simple and multiple linear regression. Prediction and diagnostic statistics. Simple smoothing and forecasting. Prereq: STAT 211. Open only to students of the School of Accountancy.</td>
</tr>
<tr>
<td>STAT 322</td>
<td>Application of Sampling Surveys</td>
<td>0.5</td>
<td>The planning of surveys; simple random sampling; stratified sampling; ratio and difference estimators; cluster and systematic sampling. Prereq: STAT 221. Not open to Honours Mathematics students.</td>
</tr>
<tr>
<td>STAT 332</td>
<td>Sampling</td>
<td>0.5</td>
<td>Review of survey sampling of populations. Elementary sampling designs. Efficiency comparisons for sampling designs and estimation procedures. Prereq: STAT 231 or equivalent. Anireq: STAT 322.</td>
</tr>
<tr>
<td>STAT 335</td>
<td>Statistical Process Control</td>
<td>0.5</td>
<td>Philosophy of process control. Control charts and their application. Acceptance sampling. Sequential methods in process control. Assessing the cost of quality. Introduction to experimental design. Prereq: One of STAT 231, M E 202, M SCI 251, SY DE 214, or consent of the instructor.</td>
</tr>
<tr>
<td>STAT 371</td>
<td>Stochastic OR Models</td>
<td>0.5</td>
<td>An introduction to the use of probabilistic models in operations research. Techniques and applications of queuing theory, inventory theory and reliability theory. Prereq: STAT 333.</td>
</tr>
<tr>
<td>STAT 420</td>
<td>Experimental Design</td>
<td>0.5</td>
<td>Introduction to designed experiments. Basic experimental designs. Factorial arrangement of treatments. Confounding and fractional replication. Selected topics. Prereq: STAT 331 or consent of instructor.</td>
</tr>
<tr>
<td>STAT 431</td>
<td>Applications of Regression Models</td>
<td>0.5</td>
<td>Review of the normal linear model; response surface methodology; non-linear normal models; linear models for binary data and cross-classification; log linear models for contingency tables; selected topics. Prereq: STAT 331.</td>
</tr>
<tr>
<td>STAT 433</td>
<td>Stochastic Processes</td>
<td>0.5</td>
<td>Point processes. Renewal theory. Stationary processes. Selected topics. Prereq: STAT 333 or consent of instructor.</td>
</tr>
<tr>
<td>STAT 440</td>
<td>Statistical Computing</td>
<td>0.5</td>
<td>Problems associated with the analysis of stochastic systems and statistical data by computer; simulation techniques, numerical algorithms, programming for statistical problems and statistical packages. Prereq: STAT 331.</td>
</tr>
<tr>
<td>STAT 443</td>
<td>Forecasting</td>
<td>0.5</td>
<td>Model building. Multiple regression and forecasting. Exponential smoothing. Box-Jenkins models. Smoothing of seasonal data. Prereq: STAT 331 or consent of instructor.</td>
</tr>
<tr>
<td>STAT 450</td>
<td>Estimation and Hypothesis Testing</td>
<td>0.5</td>
<td>Discussion of general inference problems under the headings of point and interval estimation, hypothesis testing and decision theory. Large sample normal likelihoods, maximum likelihood estimation, theory of UMV estimation, least squares, Neyman-Pearson theory of hypothesis testing. Prereq: STAT 330.</td>
</tr>
<tr>
<td>STAT 464</td>
<td>Topics in Probability Theory</td>
<td>0.5</td>
<td>Prereq: STAT 333 or consent of instructor. May not be offered 1991-92.</td>
</tr>
<tr>
<td>STAT 466</td>
<td>Topics in Statistics 1</td>
<td>0.5</td>
<td>Prereq: STAT 330 and 331, or consent of instructor. May not be offered 1991-92.</td>
</tr>
<tr>
<td>STAT 468</td>
<td>Readings in Statistics 1</td>
<td></td>
<td>STAT 444 An Introduction to Econometrics.</td>
</tr>
<tr>
<td>STAT 469</td>
<td>Readings in Statistics 2</td>
<td></td>
<td>STAT 454 Sampling Theory and Practice.</td>
</tr>
</tbody>
</table>

Note: Antireq: indicates that a course cannot be taken if another course listed is also taken.
Course Descriptions
Systems Design Engineering

SY DE 111 F 3C,1T 0.5
Calculus 1
The limit, continuity, and inverse functions. Integral calculus: fundamental theorems, integral as an area, indefinite integrals, methods of integration. Areas, volume, work, impulse and energy; polar coordinates; sequences, series and convergence.

SY DE 112 S 3C,1T 0.5
Calculus 2
Intermediate and mean value theorems, L'Hôpital's rule. Taylor/Maclaurin and other power series, convergence and applications. Functions of two variables, partial derivatives, Jacobian, gradient, extrema, series.

SY DE 114 S 3C,1T 0.5
Linear Algebra

SY DE 121 F 3C,1T 0.5
Digital Computation
Computer systems, problem solving, data and programs, structured programming, arrays, matrices and pointers, correct and efficient algorithms, data structures.

SY DE 123 W 3C,1T 0.5
Introduction to Systems Design Engineering

SY DE 124 S 3C,1T,3L (alt. weeks) 0.5
Introduction to Human Systems
Ergonomics - the man-machine environment, human sensory processes, information processing, motor function. Introduction to biomedical engineering, introduction to cognitive ergonomics.

SY DE 161 F 3C,1T,3L 0.5
Introduction to Systems Design Engineering

SY DE 162 S 3C,1T 0.5
Physics 2 (Dynamics)

SY DE 163 F 3C,1T 0.5
Chemistry

SY DE 192 S 3C,1T,2L 0.5
Digital Systems
Digital technology, combinatorial logic, binary arithmetic, synchronous sequential circuits, design methodology, algorithmic state machines, microcomputer interfacing.

SY DE 212/202 W,F 1C 0.0
Tutorial
Systems Design second-year students will meet a faculty member designated as their class professor. Performance in assignments, conceptual difficulties with courses, interrelation of coursework, later work and engineering practice will be discussed. Non-credit courses.

SY DE 211 W 3C,1T 0.5
Differential Equations

SY DE 213 W 3C,1T 0.5
Probability
Probability models, random sampling, distribution functions, independent experiments, conditional probability, Bayes Theorem. Discrete and continuous variables; mean and variance, covariance and correlation.
Course Descriptions
Systems Design Engineering

SY DE 214 F 3C,1T 0.5
Statistics
Likelihood methods, two parameter likelihoods, frequency properties, tests of significance. Analysis of Normal measurements. Applications to statistical quality and process control.

SY DE 231 W 3C,1T 0.5
Engineering Economics
This course is designed to satisfy Engineering Economics requirements of the Canadian Engineering Accreditation Board. Price and output decisions. Choosing among alternative inputs and production processes. Evaluating alternative investments, equipment service life, and new products.

SY DE 282 F 3C,1T 0.5
Linear Systems and Signals
Models and analysis of linear systems. Discrete time systems, continuous time systems; difference and differential equations; impulse and frequency response. Complex frequency, functions of complex variables, transform domain techniques: Z transforms; Fourier analysis, Laplace transform. Transfer functions and frequency response, frequency domain analysis of linear systems; sampling theory, stability, and linear filters.

SY DE 281 W 3C,2T 0.5
Mechanics of Deformable Solids
Introduction to the basic principles of mechanics of deformable solids. Prismatic members in tension, compression, shear, bending and torsion. Stress-force and bending-moment diagrams. Work and energy methods. Introduction to instability.

SY DE 282 F 3C,1T 0.5
Fluid Mechanics

SY DE 283 W 3C,1T 0.5
Physics 3 (Electricity, Magnetism and Optics)
Introduction to the fundamental laws of electricity, magnetism and optics; electric fields, voltage, resistance, current, properties of conductors and semiconductors, capacitance, properties of dielectrics, magnetic fields, Faraday’s Law and inductance, properties of magnetic materials; electromagnetic waves and the nature of light, geometrical optics: reflection and refraction, physical optics: interference and diffraction.

SY DE 292 F 3C,1T,3L 0.5
Circuits, Instrumentation, and Measurements
Active and passive circuit elements, Kirchhoff’s laws, mesh and nodal circuit analysis, principle of superposition; step response of first and second order networks; sinusoidal steady state analysis using complex impedance phasors; input-output relationships, transfer functions and frequency response of linear systems; operational amplifiers, operational amplifier circuits using negative or positive feedback; diodes, operational amplifier circuits using diodes; analog signal detection, conditioning and conversion systems; transducers, difference and instrumentation amplifiers, active filters, A/D and D/A conversion.

SY DE 301/302 S,W 1C 0.0
Tutorial
Systems Design third year students will meet with a faculty member designated as their class professor. Performance in assignments, conceptual difficulties with courses, interrelation of coursework, later work and engineering practice will be discussed. Non-credit courses.

SY DE 301 S 3C,1T 0.5
Engineering Optimization

SY DE 312 W 3C,1T 0.5
Numerical Methods
Introduction to numerical techniques for engineering problems. Topics covered include: source of computational error; solutions to linear and non-linear equations; matrix factorization; eigensystems; numerical interpolation and approximation; numerical integration, solution of ordinary and partial differential equations. Introduction to data structures and their application.

SY DE 321 S 3C,1L 0.5
Software Engineering
Structured software design, overview of programming systems and computer organization; data structures; hashing, sorting and searching; algorithm complexity, evaluation and design; event-driven and object oriented programming; concurrency. Laboratories devoted to implementing a medium sized programming project.

SY DE 324 W 3C 0.5
Data Structures and Algorithms
Data structures and algorithms in the design of algorithms, arrays, lists, trees and graphs, sorting and searching, evaluation and analysis of algorithms, application to engineering problems.

SY DE 334 W 3C 0.5
Applied Statistics
Multiple regression analysis. Assumptions, use of indicator variables, variable selection techniques, analysis of variance. Introduction to experimental design, including block designs, factorial arrangements of treatments.

SY DE 342 W 3C,1L 0.5
Industrial Ergonomics

SY DE 351 S 3C,1T 0.5
Systems Models 1
Introduction to systems modelling and analysis. Graph theoretic models and formulation of system equations. State space formulation and solution. Time and frequency domain solutions. Application to engineering systems.
The generation and forming of approaches to modelling systems for the methodology of design: defects, feasibility analysis; optimisation criteria and generation of alternative solutions. The lecture material is supplemented by a term long design project done in small groups.

SY DE 354 W 3C,1T,3L 0.5
Systems Models 2
The subject matter is similar to SY DE 351 except the development is based on other physical systems such as mechanical and hydraulic systems. Mixed nodal, state formulation and solution. Relationship to classical approaches to modelling systems for other physical systems.

SY DE 361 S 3C,1T,3L 0.5
Introduction to Design
The methodology of design: defects, needs and the problem definition; criteria and generation of alternative solutions; feasibility analysis; optimisation; selection, implementation and solution. The lecture material is supplemented by a term long design project done in small groups.

SY DE 362 W 1C,3L 0.5
Systems Design Workshop 1
Engineering design project course where students work in small groups applying the principles of engineering problem solving, systems analysis, simulation, optimization and design to a problem of their own choosing. Students have individual project supervisors as well as an overall coordinator who provides the framework for the term projects.

SY DE 364 W 3C,1T 0.5
Manufacturing Science

SY DE 372 W 3C,1T 0.5
Introduction to Pattern Recognition
Pattern recognition as a process of data analysis. Pattern features as components in a random vector representation. Classification techniques: distance measures in feature space, probabilistic (Bayesian) decision theory, linear discriminants. Clustering and feature extraction. Applications: optical character recognition, speech recognition, industrial robot vision, medical diagnosis, remote sensing and satellite image analysis, fault detection and diagnosis in complex systems such as nuclear reactors.

SY DE 381 S 3C,1T 0.5
Thermodynamics
An introductory course in engineering thermodynamics structured for students in Systems Design. Classical thermodynamics is presented as the systematic study of energy; its use, degradation, and waste. Applications focus on problems of energy and environment. The concepts of statistical thermodynamics are introduced briefly and their connections with information theory are described.

SY DE 384 W 3C,1T,2L 0.5
Materials Engineering
An introduction to the understanding of the properties and applications of engineering materials. Atomic bonding and packing; crystal defects and microstructures; elasticity, plasticity, strength and fracture; strengthening methods and transformations; fast fracture, toughness, fatigue and creep; oxidation and corrosion; case studies of materials in design.

SY DE 401/402 F,W 1C 0.0
Tutorial
Systems Design fourth year students will meet with a faculty member designated as their class professor. Conceptual difficulties, the interrelation of course work and engineering practice will be discussed. Non-credit courses.

SY DE 422 W 3C,1T 0.5
Machine Intelligence
The objective of this course is to introduce the students to current intelligent system concepts. Artificial intelligence systems in areas such as natural language understanding, speech understanding, machine vision and learning will be discussed. Methods and tools for building expert systems will be introduced.

Prereq: SY DE 352 or equivalent

SY DE 423 F 3C,1T 0.5
Computer Algorithm Design and Analysis
Design of efficient algorithms and methods for their analysis, mathematical algorithms, string processing algorithms, geometrical algorithms, exhaustive search and traversal techniques, introduction to a lower bound theory and NP completeness, examples from engineering problems.

Prereq: SY DE 352 or equivalent

SY DE 432 W 3C,1T 0.5
Numerical Optimization
Theory and algorithms for non-linear constrained optimization problems: convex set, convex functions, convex programming, Kuhn-Tucker conditions, duality, quadratic programming, quasi-Newton methods, geometric programming, dynamic programming.

SY DE 434 W 3C,1T 0.5
Random Processes in the Environment
The objective of this course is two-fold: firstly to impress on the students that most processes in the environment occur as random processes and secondly to develop in the students the capability to analyze such processes. The course will review theory of random variables and introduce concepts of random processes and time series analysis. Physical phenomena in the environment and their random nature will be discussed with examples from the hydrologic cycle, air circulation and ocean circulation.

SY DE 442 W 3C 0.5
Occupational and Environmental Systems Safety
Biomedical Engineering: Human Function and Its Measurement

This course develops an understanding of the fundamental concepts of biomedical engineering through the review of the basic functioning aspects of several major physiological systems, through the analysis of mathematical models used to represent the systems and through the study of techniques used to measure pertinent parameters of these systems. In addition, a number of current clinically used medical imaging techniques are covered.

The major physiological systems covered include the neuromuscular, cardiovascular and respiratory systems. Imaging techniques analyzed include X-ray, CT scan, ultrasound, magnetic resonance imaging and positive emission topography.

Analysis of Large Systems

Topics include decomposition techniques, graph theoretic methods of analysis, tearing of large systems into subsystems, multiport and multiterminal component representations; examples are drawn from practical large-scale systems.

Time Domain Models for Physical Systems

State equations for two-terminal component systems; time varying and non-linear components; analytical solutions for state models; numerical and analog methods of solution.

Computer Simulation of Systems

System modelling, simulation techniques for continuous and discrete systems; special purpose computer languages for systems simulation; examples and applications in a variety of areas.

Systems Design Workshop

The first half of a two term engineering design project continuing the systems design workshop sequence. An interim progress report is presented at the end of the first term.

The concluding half of the fourth year Systems Design Workshop.

Optimization Methods for Stochastic Systems

A continuation of SY DE 311, with emphasis on stochastic operations research models. Topics will include: introductory time series analysis and queuing theory. Markov decision processes, and stochastic programming. Models for optimization of large systems under uncertainty.

Linear Graph Theory and Applications

Important concepts in graph theory, their properties, relationships among them and useful graph algorithms are given in the context of various applications. Applications include but not restricted to number of variables for electrical network equations, graph theoretic solutions to electrical network equations, sparse matrix techniques, graph models for fault diagnosis, optimum distribution of traffic through networks and other network flow problems.

Computer Aided Design

Issues and direction in computer aided design (CAD); fundamental principles and concepts required in actual design and building of CAD systems; state-of-the-art of CAD systems on the market; criteria upon which to evaluate CAD systems. Additional topics such as computer-aided manufacturing, flexible manufacturing and expert systems may be included.

Conflict Analysis

Techniques from game theory for assessing the social and political influences in engineering decision making. Topics include metagame analysis, games with mistaken information, sensitivity analysis, dynamic games, probabilistic considerations, bargaining and real-world applications of all the foregoing concepts.

Environmental Systems Modelling 2

The course presents concepts of systems modelling and applies them to environmental subsystems such as energy, physical and bio-ecosystems, and to socio-economic systems. The course emphasizes the symbiotic aspects of socio-economic and environmental systems which form the basis for analysis and design of such complex projects.

Computer Aided Design

Issues and direction in computer aided design (CAD): fundamental principles and concepts required in actual design and building of CAD systems; state-of-the-art of CAD systems on the market; criteria upon which to evaluate CAD systems. Additional topics such as computer-aided manufacturing, flexible manufacturing and expert systems may be included.

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Techniques from game theory for assessing the social and political influences in engineering decision making. Topics include metagame analysis, games with mistaken information, sensitivity analysis, dynamic games, probabilistic considerations, bargaining and real-world applications of all the foregoing concepts.

Environmental Systems Modelling 2

The course presents concepts of systems modelling and applies them to environmental subsystems such as energy, physical and bio-ecosystems, and to socio-economic systems. The course emphasizes the symbiotic aspects of socio-economic and environmental systems which form the basis for analysis and design of such complex projects.
Modelling of Continuum Systems
Finite difference methods as they are applied to boundary value problems in solid mechanics and heat transfer analysis. Use of the finite difference method in the solutions of systems of higher order differential equations. The finite element method as it is applied to problems from structural and thermal analysis. Foundations and important principles of the finite element methods.

Image Processing
Beginning with a discussion of quantitative models of imaging systems, this course moves on to apply methods of linear systems theory and signal processing to image processing. Simple spatial domain techniques as well as spatial frequency domain methods and digital filter design for image enhancement and restoration are discussed. Special topics in application areas of machine vision (segmentation and feature extraction), remote sensing, medical imaging and vision models are presented throughout the term.

Prereq: SY DE 212 or equivalent

Women's Studies

Undergraduate Officer
M.G. Davies, PAS 3017, ext. 2880

W S 200
Introduction to Women's Studies
An interdisciplinary survey which introduces students to the questions which have been posed concerning women's nature, roles, problems and accomplishments. Special emphasis will be given to the methodologies which a variety of disciplines in the Arts and Sciences use to examine these questions.

WS 200, the core course of the Joint Option, is a team-taught effort by participating lecturers from the disciplines of Art, Sociology, Psychology, Philosophy, Religious Studies, Economics, Political Science and English.

W S 300
Seminar in Women's Studies
A seminar in which students examine the origins and course of the women's movement from an interdisciplinary perspective, with special attention to topics such as the Canadian woman.

Prereq: WS 200 or consent of WS Co-ordinator

Taught at Wilfrid Laurier University.

WS 365
Special Topics Course
A reading course permitting a student to work with any member of the faculty participating in Women's Studies at UW. To be arranged with the WS Director and the respective WS Faculty member.

Prereq: W S 200 or consent of Director

WS 476
Directed Reading in Women's Studies
This course would offer the opportunity for independent study of specialized areas, theory and methodology, texts, discourses and writers of interest in the context of women's history, status and condition. The students would be under tutorial guidance by a faculty member(s) involved in the Women's Studies Option.

Prereq: W S 200 or consent of Director

Women's Studies core courses and approved courses are listed in the interdisciplinary Options, Chapter 15.

Ukrainian

For courses in Ukrainian see Germanic and Slavic Languages and Literatures.
Lecturing on Occupational Biomechanics in a KIN 420 Lab.
# Academic Courses by Department and Faculty

University faculty members are listed by their academic course or discipline areas as follows:

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<thead>
<tr>
<th>Course/Discipline</th>
<th>Department/Group/School</th>
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</thead>
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<td>Accounting</td>
<td>School of Accountancy</td>
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<tr>
<td>Actuarial Science</td>
<td>Department of Statistics and Actuarial Science</td>
</tr>
<tr>
<td>Anthropology</td>
<td>Department of Anthropology</td>
</tr>
<tr>
<td>Applied Mathematics</td>
<td>Department of Applied Mathematics</td>
</tr>
<tr>
<td>Architecture</td>
<td>School of Architecture</td>
</tr>
<tr>
<td>Biology</td>
<td>Department of Biology</td>
</tr>
<tr>
<td>Canadian Studies</td>
<td>Department of Chemical Engineering</td>
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<tr>
<td>Chemical Engineering</td>
<td>Department of Chemistry</td>
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<tr>
<td>Chemistry</td>
<td>Department of Civil Engineering</td>
</tr>
<tr>
<td>Civil Engineering</td>
<td>Department of Classical Studies</td>
</tr>
<tr>
<td>Classical Studies</td>
<td>Department of Combinatorics and Optimization</td>
</tr>
<tr>
<td>Combinatorics and Optimization</td>
<td>Department of Electrical and Computer Engineering</td>
</tr>
<tr>
<td>Computer Engineering</td>
<td>Department of Computer Science</td>
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<tr>
<td>Computer Science</td>
<td>Department of Germanic and Slavic Languages and Literatures</td>
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<tr>
<td>Croatian</td>
<td>Dance Department</td>
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<tr>
<td>Dance</td>
<td>Drama and Theatre Arts Group</td>
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<td>Dutch</td>
<td>Department of Germanic and Slavic Languages and Literatures</td>
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<tr>
<td>Earth Sciences</td>
<td>Department of Earth Sciences</td>
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<td>East Asian Studies</td>
<td>Department of Economics</td>
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<tr>
<td>Economics</td>
<td>Department of Electrical and Computer Engineering</td>
</tr>
<tr>
<td>Electrical Engineering</td>
<td>Department of English</td>
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<tr>
<td>English</td>
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<td>French Language (Studies in the)</td>
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<td>Polish</td>
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<td>Political Science</td>
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<td>Department of Recreation and Leisure Studies</td>
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<td>Russian</td>
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<td>Sexuality, Marriage and the Family</td>
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<td>Speech Communication</td>
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<td>Department of Systems Design Engineering</td>
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<tr>
<td>Ukrainian</td>
<td>Department of Germanic and Slavic Languages and Literatures</td>
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Accounting

Associate Professor, Director, The School of Accountancy
The Society of Management Accountants of Ontario Professor of Management Accounting
H.M. Armitage, BSc (McGill), MBA (Alberta), PhD (Michigan State), CMA

Associate Professor, Associate Director, Undergraduate Officer
G.W. Russell, BComm, MBA (McMaster), CMA, FCMA

Assistant Professor, Graduate Officer
W.R. Scott, BComm, MBA (Alberta), PhD (Queen's), CMA

Assistant Professor, Research and Education Chair
D.T. Carter, BComm, MBA (Windsor), CA

Professor, The Centre for Accounting Research and Education Chair
W.R. Scott, BComm (Carleton), MBA, PhD (Chicago), CA, FCA

Professor, The J. Page R. Wadsworth Chair in Accounting and Finance
P.P. Boyle, BComm (Queen's, Belfast), FCA (London), FCA

Professors
J.K. Courtis, BComm, MComm (Melbourne), MBA, PhD (Minnesota), FASA (Australia)
L.G. Eckel, BA, BComm (Saskatchewan), MBA, PhD (Michigan), CA, FCA
J.R. Hanna, BComm (McMaster), MBA, PhD, (Michigan), CA, FCA
S.N. Laiken, BA (Western Ontario), MBA (Waterloo), PhD (Western Ontario), MCABV
W.R. Thirk, BA (British Columbia), MA, PhD (Yale)
D. W. Wilson, BComm (McMaster), PhD (Massachusetts Institute of Technology)

Associate Professors
R.E. Beam, BA (Western Ontario), CA, FCA
J.E. Boritz, BA, MBA (York), PhD (Minnesota), CA, CISA, FCA
W.M. Lemon, BA (Western Ontario), MDA (Toronto), PhD (Texas at Austin), CA, FCA, CPA
A.R. Olsen, BComm (Sir George Williams), MBA (Western Ontario)

Assistant Professors
G. Richardson, BA (Toronto), MBA (York), PhD (Cornell), CA
G. Ansung, BA (Ghana), MAcc (Waterloo), MA, PhD (Queen's)
S. Banyopadhyay, B.Tech (Indian Inst. Technology, India), MBA (Indian Inst. Management, Calcutta), PhD (Iowa)
J.J. Barnett, BComm (Queen's), CA
S.P. Gunz, BA, LLB, MA (Sydney), MBA (Manchester)
J.L. Kao, BComm (Alberta), CA
D.B. Kennedy, BMath (Waterloo), MBA (McMaster), MS, PhD (Cornell), CMA
F.C. Shen, BA, MA, PhD (Simon Fraser)
R.T. Vachon, BComm (Ottawa), MAcc (Laval), CA
K.R. Vatsal, BA, MA (Toronto)

Lecturer
I.D. McIllo, BIS (Waterloo), DipBA (Wilfrid Laurier)

Adjunct Faculty
P.R. Bish, BA (Waterloo), CA
P.A. Lubka, BBA, MBA (Wilfrid Laurier), CMA

Faculty Members of Accounting holding cross appointments to:
1. Statistics
2. Economics

Accounting Advisory Council Members

The Accounting Advisory Council was established in 1983 to provide liaison between the School of Accountancy and senior representatives from business, government and public accounting practice. Council meetings are normally held three times a year.

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Mr. J.C. Barratt, Retired
Mr. J.T. Black, Chairman, The Molson Companies Limited
Mr. W.E. Bradford, President and Chief Executive Officer, North American Life Insurance Co.
Mr. D.A. Brown, Executive Partner, Coopers & Lybrand
Mr. Terry Clarke, B.F. Goodrich
Mr. G.E. Cronkright, Executive Partner, Calgary Office, Ernst & Young
Mr. K.M. Dye, Auditor General of Canada, Government of Canada
Mr. G.C. Fowler, Partner, Peat Marwick Thorne
Mr. S.J. Gaston, Partner, Price Waterhouse

Mr. J.L. Goodfellow, Executive Partner, Deloitte Touche
Mr. R.G. Harris, Executive Partner, Deloitte Touche
Mr. R.H. Healey, Partner, Peat Marwick Thorne
Mr. T.G. Hierin, Partner, Peat Marwick Thorne
Mr. D.C. Higginbotham, Partner, Price Waterhouse
Mr. D.H. Houston, President and Chief Executive Officer, Swimming Canada Natation
Mr. K. Hurdle, Sole practitioner
Mr. G.S. Knights, Vice-President, CP Trucks
Mr. E.J. Lang, Executive Vice-President, R.J. Reynolds Tobacco International Inc.
Mr. J.A. Milburn, Partner, Ernst & Young
Mr. R.T. Neville, Partner, Dunwoody & Company
Mr. J.F. Otterman, Assistant Provincial Auditor, Province of Ontario
Mr. H.J. Pankratz, Executive Partner, Vancouver Office, Ernst & Young
Mr. M. Rayner
Mr. I.L. Rosen, Partner, Rosen, Ezrin, Opus & Company
Ms. N.B. Shroff, Partner, Arthur Andersen & Company
Mr. J.W. Sinclair, President and Chief Executive Officer, Moore Corporation Limited
Mr. J.A. Stacey, Partner, Deloitte Touche
Mr. T.R. Turnbull, Chairman, Peat Marwick Thorne
Mr. W.R. Walker, Senior Partner, Peat Marwick Thorne
Mr. C.D. Weyman, Partner, Peat Marwick Thorne

Mr. S.J. Gaston, Partner, Price Waterhouse
University Faculty
Actuarial Science — Applied Mathematics

Actuarial Science
For faculty listing consult Statistics and Actuarial Science.

Anthropology

Professor, Department Chair
D.A. Counts, BS (S.W. Texas State University), MA (Kentucky), PhD (Southern Illinois)

Associate Professors
T.S. Abler, BA (Northwestern), MS (Wisconsin, Milwaukee), PhD (Toronto)
M.H. Hill, BA (Washington), MA (Washington State), PhD (Southern Illinois)
A.C. Zeller, BSc (Trent), MA, PhD (Toronto)

Adjunct Faculty
D.G. Willms, BA (Waterloo), MA (McMaster), PhD (British Columbia)

Applied Mathematics

Professor, Department Chair
F.O. Goodman, BSc, PhD, DSc (Lavran), CPsys, FINstP, FAIP, FIMA

Associate Professor, Associate Chair, Graduate Officer
E.R. Vrscay, BSc, MMath, PhD (Waterloo), NSERC University Research Fellow

Assistant Professor, Associate Chair, Undergraduate Officer
B.J. Marshman, BSc, MSc, PhD (Waterloo)

Professors
R.H. Bartels, BS, MS (Michigan), PhD (Stanford)
J. Cizek, RNDr (Charles University, Prague), CSC (Czechoslovak Academy of Sciences, Prague), FRSC
C.B. Collins, BSc (London), PhD (Cambridge)
H.F. Davis, SB, SM, PhD (Massachusetts Institute of Technology)
S.G. Davisison, BSc, MSc, PhD, DSc (Manchester), FINstP
B. Forte, PhD, DSc (Pisa), Habil (Rome)
J.A. George, BSc, MSc (Alberta), PhD (Stanford)
G.M.L. Gladwell, BSc, PhD, DSc (London)
W.H. Hu, BSc (Peking), PhD, DSc (Southampton)
G.J. Lastman, BASc, MA (British Columbia), PhD (Texas)
S.P. Lipshitz, BSc (Natal), MSc (South Africa), PhD (Witwatersrand)
F.R.W. McQuarrie, BSc, PhD (British Columbia)
I.J. McGee, BASc (Toronto), MSc (Waterloo), PhD (Yale)
J. Paldus, RNDr (Charles University, Prague), CSC (Czechoslovak Academy of Sciences, Prague), FRSC
P.J. Ponzo, BASc, MA (Toronto), PhD (Illinois)
R.B. Simpson, BSc, MASc (Toronto), PhD (Maryland)
J. Wainwright, BSc (Natal), PhD (South Africa), Recipient of the Distinguished Teacher Award

Associate Professors
C.F.A. Beaumont, BA (McMaster), MA (Toronto)

P.A. Forsyth, BSc (Western Ontario), MSc (Australian National), PhD (Western Ontario)
J. Froese, BA (Manitoba), MA (Queen’s), PhD (British Columbia)
K.O. Geddes, BA (Saskatchewan), MSc, PhD (Toronto)
W.K. Liu, BSc, MS, PhD (Illinois)
R.B. Mann, BSc (McMaster), MSc, PhD (Toronto)
G. Tenli, Laurea (Rome), MSc, PhD (Toronto)
V.M. Zaidan, BSc (Reinit), MA (Dalhousie), PhD (British Columbia)

Assistant Professors
M.C. Chidichimo, lic.phy. (Buenos Aires), PhD (Cambridge)
X. Liu, BSc (Shandong), MSc, PhD (Texas)
K.A. Morris, BSc (Queen’s), MMath, PhD (Waterloo)
W.L. Seward, BSc (Victoria), MSc, PhD (Toronto)
D. Siigel, BA (California, Los Angeles), PhD (Stanford)
S. Sivaloganathan, BS, MSc, DPhil (Oxford)
W.P. Tang, BS (Fudan), MS, PhD (Stanford)

Adjunct Faculty
W.F. Ames, MS (Wisconsin)
A.T. Amos, BSc (London), DIC (Imperial College), PhD (London)
J. Carminati, BSc (Victoria), MSc (Melbourne), PhD (Victoria)
D.G. Crighton, BA, MA (Cambridge), PhD (London)
M.A. Donelan, PhD (British Columbia)
W.F. Langford, PhD (California)
J.D. Lawson, BASc (Toronto), MSc, PhD (Waterloo), FINstP, FIMA
C. Rogers, BA (Oxon), MEd (Toronto), MSc, PhD (Nottingham), FINstP, FIMA

Faculty Members of Applied Mathematics holding cross appointments to:

Chemistry
Mechanical Engineering
General Engineering

Faculty Members holding cross appointments to Applied Mathematics from:

Computer Science
Civil Engineering
Chemistry
Physics
Architecture

Associate Professor, Director, The School of Architecture
E.R. Haldenby, BES, BArch (Waterloo), Recipient of the Distinguished Teacher Award

Associate Professor, Associate Director
T. Seebohm, BEng, MEng, PhD (McGill), MArch (California, Berkeley), OAA, PEM

Assistant Professor, Associate Director (Rome)
T. Seebohm, BArch (Rome), MArch (Toronto)

Assistant Professor, Undergraduate Officer
T. Meyer Boake, BES, BArch (Waterloo), MArch (Toronto)

Professors
A. Baneji, BArch (Calcutta), MArch (North Dakota State)
L.A. Cummings,1 AB (Washington, AM (Missouri), PhD (Washington), Recipient of the OCUFA (Ontario) Teaching Award
L.W. Richards, BArch (Miami, Ohio), MArch (Yale), OAA, MRAIC
F. Thompson, BArch, MArch (Toronto), OAA, MRAIC
F.H. Watts, AA Dip (London), MLA (Harvard), MRAIC

Associate Professors
O. Dutt, BA (Punjab), BSc (London), MS (Wisconsin), PhD (Waterloo), PEM
M. Elmitt, National Diploma in Design (High Wycombe)
B.R. Hunt, AA Dip (London), RIBA, MRAIC
D.B. McIntyre, BArch (Toronto), MRAIC
D. McKay, BArch (Toronto)
R.M. Schuster2 BS, MS (North Dakota State), PhD (Iowa State), PEM
R. Wiljer, BA (Waterloo), MA (Ottawa)

Assistant Professors
R.J. van Pelt, Cand.Lit., Drs.Lit., D.Lit. (Leiden)
V. Ryninmitter, BES, BArch (Waterloo)

Adjunct Faculty
R. Andighetti, BES, BArch (Waterloo)
P. Brock, BArch (Montreal), OAA, MRAIC
W. Gastmeier, BSc, MASC (Waterloo), PEM

W. Lamb, BArch (McGill), FRAIC
M.L. Lobsinger, BES, BArch (Waterloo)
D. Ravington, AA Dip (London), P. Syme, BArch (Toronto)

Guest Critics and Lecturers in the School of Architecture January 1 - November 30, 1990
Nils Adler
Scott Arnold
Ron Awe
George Baird
Barry Belt
Shirley Blumberg
Timothy Boyd
Martin Bressani
James Brown
Andrew Clarke
Nigel Coates
Beatrix Colomina
Arthur Erickson
Andrew Fox
Ted Goossen
Victoria Gregory
Pat Hanson
George Hersay
Brian Hill
Dan Hoffman
Lloyd Hunt
Margaret Ishii
Victor Jaunkalns
Barney Lawrence
Andrew Levitt
Malcolm Lobban
John MacDonald
Victoria Manica
Steven Mannell
Michael McColl
Breck McFarlane
Meryanne McKenna
Mark Michasiw
Barton Myers
Nolan Natalie
Robert Pavlich
Thomas Payne
Alberto Perez-Gomez
Paul Reuber
Kathryn Saunders
Tony Scherman
Tim Scott
John Shnier
Jon Soules
Mark Sterling
Anne Stevens
Billie Tser
Frederic Urban
Jeff Vaswy
Todd Williams
Eberhard Zeidler

Faculty Members of Architecture holding cross and/or joint appointments to:
1. English
2. Civil Engineering

Biology

Associate Professor, Department Chair
D.G. Dixon, BSc (Sir George Williams), MSc (Concordia), PhD (Guelph), Recipient of the Distinguished Teacher Award

Professor, Associate Department Chair
W.E. Inniss, BSA, MSA (Toronto), PhD (Michigan State)

Associate Professors, Undergraduate Officers
M. Globus, BSc, MSc (McGill), PhD (Toronto)
W.R. Hawthorn, BSc, MSc (McMaster), PhD (Western Ontario)
P.E. Morrison, BSc, MSc (Western Ontario), PhD (McMaster)

Assistant Professor, Undergraduate Officer
D.R. Barton, BA (Ohio Wesleyan), MSc (Akron), PhD (Waterloo)

Associate Professors, Graduate Officers
J.J. Haikkila, BSc, MSc, PhD (Toronto)
W.D. Taylor, BSc, PhD (Toronto)

Professor Emeritus
H.B.N. Hynes, BSc, PhD, DSc (London), DSc (Waterloo), ARCS, FRSC

Professor, NSERC/Allelix Industrial Research Chair in Microbial Biotechnology
O.P. Ward, BSc, PhD (Dublin)

Professors
N.C. Bots, BSc (Simon Fraser), MSc (British Columbia), PhD (Toronto), Recipient of the Distinguished Teacher Award
R.G.H. Downer,2 BSc, MSc (Queen’s, Belfast), PhD (Western Ontario), DSc (Belfast), Recipient of the Distinguished Teacher Award
E.B. Dumbroff, BSc, MForestry, PhD (Georgia)
H.C. Duthie, BSc, PhD (Wales)
C.H. Fernando, BSc (Ceylon), DPhil (Oxford)
B.R. Glick, BSc (City College of New York), MSc, PhD (Waterloo)
W.B. Kendrick,2 BSc, PhD, DSc (Liverpool), FRSC
J.Kruuv,4 BSc, MSc (Waterloo), PhD (Western Ontario)
J.R. Lepock,4 BS, MS (West Virginia), PhD (Pennsylvania State)
C.I. Mayfield, BSc, PhD (Liverpool)
University Faculty

Biology

Canadian Studies

J.K. Morton, BSc, PhD (Durham), DSc (Newcastle-upon-Tyne), FLS
J.J. Paatarnak, DA, MA (Toronto), PhD (India)
C.A. Peterson, BSc, MSc (Alberta), PhD (California, Davis)
G. Power, BSc (Durham), PhD (McGill)
J.C. Sempé, BSc (Tulsa), MA, PhD (Washington University, St. Louis)
J. Sivak, 8 LScC (Montreal), MS (Indiana), PhD (Cornell), OD (Pennsylvania College of Optometry)
J.E. Thompson, 1 BSc (Toronto), PhD (Alberta), FRSC

T. Viswanatha, 6 MSc, PhD (Mysore), Recipient of the Distinguished Teacher Award

Associate Professors

J.C. Carlson, 8 BSc, MSc, PhD (Massachusetts)
A.M. Charles, BSc, MSc, PhD (Manitoba)
A.G. Kempton, BSA, MSA (Toronto), PhD (Michigan State)
S.M. Smith, BSc, MSc (McMaster), PhD (Manitoba), Recipient of the Distinguished Teacher Award
K. Zachariah, BSc (Madras), BA Hon (Oxford), MA, PhD (Princeton)

Assistant Professors

G.W. Brodland, 6 BScE, MSc, PhD (Manitoba)
B.M. Greenberg, BSc (California, Berkeley), PhD (Colorado)
M. Griffioth, BA (Mount Holyoke), MFS (Yale), PhD (Minnesota)
K.M. Kovacs, BSc (York), MSc (Lakehead), PhD (Guelph)
R.L. Legge, 7 BSc (Calgary), PhD (Waterloo), NSERC Research Fellow
B.A. Moffatt, BSc (Guelph), PhD (Toronto)
R.E.H. Smith, BSc (Guelph), PhD (McGill)
S. Vethamany-Globus, BSc, MA, MSc (Madras), PhD (Toronto)

Research Professor

N.R. Tunhurk, BSc (Mysore), MSc (Banaras), PhD (Waterloo)

Research Associate Professor

B.G. Werner, 8 BES, MSc (Waterloo), PhD (Simon Fraser)

Research Assistant Professor

T.J. Singh, BSc, PhD (Manitoba), NSERC University Research Fellow

Adjunct Faculty

R. Aloni, BSc, MSc, PhD (Tel Aviv University)
P.A. Catton, MD (Ottawa), LMCC, FRCP(C)
H.R.N. Eydt, BSc, MSc, PhD (McMaster)
A.D. Harrison BSc, MSc, BEd, PhD (Cape Town)
P.V. Hudson, BSc (McGill), MSc (New Brunswick), PhD (Guelph), Canada Centre for Inland Waters
R.J. Kemble, BSc (North East London Polytechnic, UK), PhD (King's College, London, UK)
V.C. Nealis, BSc, MSc (Carleton), PhD (British Columbia), Great Lakes Forestry Centre
G.G. Stewart, BSc (Wales), PhD (Bath)
The Labatt Brewing Company, London

Instructors

J.F. Brookfield, BA, BEd, BSc, MSc (Dalhousie)
L. Pasternak, BA, MA (Toronto)
N.J. Scott, BSc, MBA (McMaster), MSc (Waterloo)
K.E. Trevers, BSc (Acadia), MSc (Waterloo)

Faculty Members of Biology holding cross appointments to:
1Chemistry
2Environment and Resource Studies
3Health Studies

Faculty Members holding cross appointments to Biology from:
4Physics
5Optometry
6Chemistry
7Chemical Engineering
8Civil Engineering
9Earth Sciences

Canadian Studies

Professor, Director of the Program
W. Klassen, BA (Goshen College), BD (Goshen Seminary), PhD (Princeton Theological Seminary)

Associate Professors, Canadian Studies Program
P. Greenhill, BA (Trent), MA (Memorial), PhD (Texas), Canada Research Fellow
S.E. McMullin, BA, MA (Carleton), PhD (Dalhousie)

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R.R. Krueger, BA, MA (Western Ontario), PhD (Indiana)

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J.R. Dugan, BA, MA (Toronto), PhD (Yale)
L. Enns, ARCT (Toronto), BSM (CMBC), BMus (Wilfrid Laurier), MMus, PhD (Western Ontario)
M.W. Higgins, BA (St. Francis Xavier), MA, PhD (York), J E. Kliman, MA, PhD (Toronto)
W.R. Needham, BComm (Carleton), MA, PhD (Queen's), Chair
F.C. Gérard, MA (College St. Dominique, France), BU, S1M (McGill), PhD (Hartford Seminary Foundation), P
E.F. Shields, AB (Chestnut Hill), MA (Villanova), PhD (Illinois)

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R. Helmes-Hayer, BA/BPHE, MA (Queen's), PhD (Toronto)

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S.D. Burt, BA, MA (Waterloo), PhD (York)
P. Greenhill, BA (Trent), MA (Memorial), PhD (Texas)
E. Kliman, MA, PhD (Toronto)
K.M. McLaughlin, BA (Waterloo), MA (Dalhousie), PhD (Toronto)
Chemical Engineering

Professor, Department Chair
F.R.W. McCourt, BSc, PhD (British Columbia)

Professor, Associate Department Chair
R.G. Woolford, MSc (Western Ontario), PhD (Illinois), FCIC

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G.F. Atkinson, MA, PhD (Toronto), CChem, FRSC(UC), FCIC
M.F. Tehrani, BSc (Alberta), PhD (Western Ontario), Recipient of the Distinguished Teacher Award
G.E. Toogood, BSc, PhD (Nottingham), CChem, FRSC(UC), FCIC

Professor, Graduate Officer
J.J. Sloan, BSc, PhD (Queen's)

Associate Professor, Graduate Officer
M.J. Chong, BSc, PhD (British Columbia), NSERC University Research Fellow

Professors Emeritus
F.W. Karasek, BS (Elmhurst), PhD (Oregon State), FCIC
W.A.E. McBryde, MA (Toronto), PhD (Virginia), FCIC
W.B. Pearson, DFC, MA, DSc (Oxford), DSc (Waterloo), FRSC, FCIC

Professors
P.F. Bernath, BSc (Waterloo), PhD (Massachusetts Institute of Technology)
A.J. Carty, BSc, PhD (Nottingham), FRSC, FCIC
P.C. Chieh, BSc (Nat. Taiwan), MSc (Nat. Tsing Hua), PhD (British Columbia)
J. Cizmek, RNDr (Charles University, Prague), CSc (Czechoslovak Academy of Sciences, Prague), FRAS
R.G.H. Downey, BSc (Queen's, Belfast), PhD (Western Ontario), DSc (Belfast), Recipient of the Distinguished Teacher Award
D.E. Irish, BSc (Western Ontario), MSc (McMaster), PhD (Chicago), FCIC, Recipient of the Distinguished Teacher Award, OCUFA Teaching Award 1998
N.R. Isenor, BSc (Acadia), MSc, PhD (McMaster)
R.J. LeRoy, BSc (Waterloo), PhD (Wisconsin)

Adjunct Faculty
G.S. Mueller, BASc (Waterloo), MSc, PhD (Manchester), PEng
A. Rudin, BSc (Alberta), PhD (Northwestern), PEng

Faculty Members of Chemical Engineering holding cross appointments to:
1Chemistry
2Biology

Faculty Members holding cross appointments to Chemical Engineering from:
3Civil Engineering

* Also has Adjunct appointment
University Faculty
Chinese
Civil Engineering

H.G. McLeod, MA, PhD (Toronto), (Retired)
T.B. McMullan, BSc (Alberta), PhD (California Institute of Technology)
J.B. Moffat, BA, PhD (Toronto), FCIC
K.F. O'Driscoll, BChE (Pratt Institute), MA, PhD (Princeton) FCIC
J. Paldus, RNDr (Charles University, Prague), CS (Czecho Slovak Academy of Sciences, Prague), FRSC
L.W. Reeves, BSc, PhD, DSc (Bristol) FRSC, FCIC
G.L. Rempe, BSc, PhD (British Columbia), FCIC
H.D. Sharma, MSc (Delhi), PhD (California), FCIC
V.A. Sniedkis, BSc (Alberta), MS (California), PhD (Oregon), FCIC
J.E. Thompson, BSA (Toronto), PhD (Alberta)
T. Viswanatha, MSc, PhD (Mysore), Recipient of the Distinguished Teacher Award

Associate Professors
D.A. Brisbin, BSc (Alberta), PhD (Toronto)
L.J. Brubacher, BA (Goshen College, Indiana), PhD (Northwestern)
J.B. Capindale, MA, DPhil (Oxford)
S. Collins, BSc, PhD (Calgary)
G.I. Dmitrienko, BSc, PhD (Toronto)
W.L. Elsdon, MSc (Western Ontario), PhD (McGill), (Retired)
R.J. Friesen, BSc, MSc (Manitoba)
J.W. Hepburn, BSc (Waterloo), PhD (Toronto), NSERC University Research Fellow
J.L. Koppel, BA, PhD (Toronto), FCIC, (Retired)
D. Mackay, BSc, PhD (Aberdeen)
T.B. Marder, BSc (Massachusetts Institute of Technology), PhD (California, Los Angeles)
A.D. Maynes, MA, PhD (Toronto), (Retired)

Assistant Professors
M.M. Gugdekuuk, BSc, PhD (Ohio State)
J.F. Honke, BSc, PhD (McGill)
G.A. Lajolie, BSc (Sherbrooke), PhD (McGill)
K.T. Leung, BSc, PhD (British Columbia)
L.F. Nazari, BSc (British Columbia), PhD (Toronto)
J. Pawlak, BSc, MS (Technical University of Gda sk, Poland), PhD (Southern Illinois, Carbondale)

Adjunct Faculty
T.E. Gough, BSc, PhD (Leicester), Victoria
R.G.A. Rodrigo, BA (Ceylon), PhD (Nottingham), Wilfrid Laurier University

A. Rudin, BSc (Alberta), PhD ( Northwestern)
G. Scoles, Doctorate in Chemistry (Genova), LibDoc, FCIC, Princeton
N.J. Taylor, BSc, PhD (Surrey)
I.D. Williams, BSc, PhD (Bristol), Penn State

Senior Demonstrators
S.O. de Silva, BSc (Ceylon), PhD (Waterloo)
J.J. Fisher, BSc, MSc, PhD (Waterloo)
S. Forsay, BSc, MSc (Waterloo)
S.M. Harvey, BSc, PhD (Olivet Nazarene University, Illinois)

Faculty Members of Chemistry holding cross appointments to:
1. Physics
2. Applied Mathematics
3. Chemical Engineering
4. Biology

Faculty Members holding cross appointments to Chemistry from:
5. Applied Mathematics
6. Chemical Engineering
7. Biology
8. Physics

*Also has Adjunct appointment

For faculty listing consult East Asian Studies.

Chinese

Civil Engineering

Professor, Department Chair
G.J. Farquhar, BASc (Waterloo), PhD (Wisconsin), PEng, Recipient of the Distinguished Teacher Award

Associate Professor, Associate Chair, Undergraduate Studies
B. Leclercq, BEng (West Australia), MASC, PhD (Waterloo), PEng

Professor, Associate Chair, Graduate Studies
K.N. Smith, BASc (Toronto), MSc (Illinois), PhD (Waterloo), PEng

Professor Emeritus
J.T. Pinder, MSc (Warsaw and Lodz), PhD (Polish Academy of Science, Warsaw), DSc (Gdansk), PEng

Professor, Norman W. McLeod Engineering Professor of Asphalt Pavement Technology
R.C.G. Haas, BSc, MSc (Alberta), PhD (Waterloo), PEng, FCAE

Associate Professor, Northern Telecom Professor of Engineering Impact on Society
N.R. Ball, BA (McMaster), MA, PhD (Toronto)

Professors
S.T. Ariaratnam, BSc (Eng) (Ceylon), BSc, MSc, PhD (Cambridge)
E.F.P. Burnett, BSc, MSc, PhD (London), PEng
M.Z. Cohn, MSc (Bucharest), PEng
M.B. Dusseau, BSc, MSc, PhD (Alberta), PEng
G.M.L. Gladwell, BSc, PhD (London)
R. Green, BSc, MSc (London), PhD (Waterloo), PEng
D.E. Grierson, BASc, MASc, PhD (Waterloo), PEng
V.K. Handa, BSc (Calcutta), BSc (England) (London), MSc (Queen's), MASc, PhD (Waterloo), PEng
B.G. Hutchinson, BE (Sydney), MSc (Queen's), PhD (Waterloo), PEng,
Recipient of the Distinguished Teacher Award

N. Kouwen, BASc, PhD (Waterloo), PEng

W.C. Lennox, BASc, MSc (Waterloo), PhD (Leigh), PEng

N.C. Lind, MSc (Technical University of Denmark), PhD (Illinois), FRSC, FCAE

E.L. Matyas,3 BASc (Toronto), DIC, PEng (London), PEng

E.A. McBean, BASc (British Columbia), SM, CE, PhD (MIT), PEng

W.A. McLaughlin, BSc (Saskatchewan), MSc, PhD (Purdue), PEng

G.M. McNeice, BASc (Waterloo), PhD (London), PEng (on leave)

T. Prasad, BSc, MSc (Banaras Hindu), PhD (Cambridge)

J. Rolfe, BASc (Waterloo), PhD (London), PEng

A.N. Sherbourne, BSc, DSc (London), BS, MS (Lehigh), MA, PhD (Cambridge), Eur. Ing., PEng

J. Shortreed, BEngSc (Western Ontario), MSc (Queen's), PhD (Northwestern), PEng

S.I. Solomon, CivHyd Eng (Bucharest), PhD (City University, London), PEng, (Retired)*

J.F. Sykes, BASc, MSc, PhD (Waterloo), PEng

T.H. Topper, BASc (Toronto), PhD (Cambridge), PEng

S. Yagar, BASc, MSc (Toronto), PhD (California), PEng

Associate Professors

R.W. Cockfield, BSc, MSc (Queen's), PhD (Waterloo), PEng

L. Rothenburg,3 Dipl Phy (Moscow), PhD (Carleton), PEng

F.F. Saccomanno, BS(CE), MCP (Manitoba), PhD (Toronto), PEng

R.M. Schuster,6 BS, MS (North Dakota State), PhD (Iowa State), PEng

J.C. Thompson, BASc (Toronto), MS, PhD (Illinois), PEng

Assistant Professors

G.W. Brodliland,5 BScE, MSc, PhD (Manitoba), PEng

E.D. Souls, BASc (Waterloo), MSc (Memorial), PhD (Waterloo)

N.R. Thomson, BASc, MSc, PhD (Waterloo), PEng

N. El Yacou,7 BSc, PhD (London)

Research Professor

J.A. Franklin,7 BSc (Eng) (London), MSc, DIC, PhD (Imperial College, London), PEng

Research Assistant Professors

A. Bogobowicz, MSc, Dipl Numerical Methods, DSc (Warsaw)

M. LaRenge, DEC (Jonquière), BSc, MSc, PhD (Montreal)

Lecturer

G.E. Cameron, BASc, MASc, PhD (Waterloo), PEng

Adjunct Faculty

K. Hadipour, BSc (Sussex), MSc, PhD (Alberta)

E.F. Hall, BSc, MSc, PhD (McMaster), PEng

J.P. Jolly, BSc (New Brunswick), MSc (Toronto), PhD (Colorado State), PEng

W.R. Petri, DiplEng (Berlin), DEng (Waterloo), PEng

F.A. Rogers, BASc, MASc (Waterloo)

D.W. Schnurr, BASc (Toronto), LLB (Queen's), PEng

G. Tsang, BE, MEngSc (New South Wales), PhD (Waterloo)

Faculty Members of Civil Engineering holding cross appointments to:

1. Applied Mathematics
2. Chemical Engineering
3. Earth Sciences
4. Biology
5. History
6. Architecture
7. Earth Sciences

*Also has Adjunct appointment

Classical Studies

Associate Professor, Department Chair
R.L. Fowler,2 BA, MA (Toronto), DPhil (Oxford)

Assistant Professor and Undergraduate Officer
R.L. Porter, BA (McMaster), MA, PhD (Princeton)

Professor

P.Y. Forsyth,1,2 AB (Mount Holyoke), MA, PhD (Toronto), Recipient of the Distinguished Teacher Award

Associate Professor
L.A. Curchin,2 BA (Western Ontario), MA (Toronto), MA (Carleton), PhD (Ottawa)

Assistant Professors

S.L. Ager,2 BA, MA (Queen's), PhD (British Columbia)

S.B.P. Haag, BA, MA (Queen's), MA (Waterloo), MPhil (Toronto)

L.L. Neuru,6 BA (San Francisco), MA (Oregon), PhD (McMaster)

Participating Faculty in Classics at Wilfrid Laurier University

J. Freed, BA (Goshen), MA, PhD (Alberta)

N.A. MacLean, BA (McMaster), MA, PhD (Wisconsin)

G.P. Schaus, BA, MA (Dalhousie), PhD (Pennsylvania)

C.J. Simpson, BA, MPhil (Nottingham), PhD (Alberta)

J. Zeyl, BA, MA (Toronto), PhD (McMaster)

Faculty Member of Classical Studies holding cross appointment to:

1. Fine Arts
2. History
Combinatorics and Optimization

Professor, Department Chair
I.P. Goulden, BMath, MMath, PhD (Waterloo)

Professor and Associate Chair for Undergraduate Affairs
C.J. Colbourn, BSc (Toronto), MMath (Waterloo), PhD (Toronto)

Professor and Associate Chair for Graduate Affairs
H. Wolkowicz, BSc, MSc, PhD (McGill)

Lecturer, Associate Dean Faculty Programs
R.G. Dunkley, BA (Western Ontario)

Professor Emeritus
W.T. Tutte, BA, MA, PhD (Cambridge), DMath (Waterloo), FRS, FRSC

Professor, OP/NSERC Industrial Research Chair in Optimization and Computer Applications
W.R. Pulleyblank, BA, MSc (Calgary), PhD (Waterloo)

Professors
M.J. Best, BMath, MMath (Waterloo), Ph.D. (California, Berkeley)
J.A. Bondy, BA, DPhil (Oxford)
A.R. Conn, BSc (Imperial College), MSc (Manchester), PhD (Waterloo)
L.J. Cummings, BSc (Roosevelt), MSc (de Paul), PhD (British Columbia)
J. Edmonds, BA (George Washington), MS (Maryland)
C.D. Godsil, BSc, MSc, PhD (Melbourne)
D.M. Jackson, BA, MA, PhD (Cambridge)
R.C. Mullin, BA (Western Ontario), MA, PhD (Waterloo)
L.B. Richmond, BSc, MSc (Manitoba), PhD (Alberta)
S.A. vanstone, BMath, MMath, PhD (Waterloo), J
D.H. Younger, AB, BS, MS, PhD (Columbia)

Associate Professors
L.J. Dickey, BSc, MA (Arizona), PhD (Wisconsin)
C.E. Haft, BS (Stanford), PhD (Waterloo)
R.A. Honenberger, BA (Toronto), MA (Waterloo)
U.S.R. Murty, BA (Andhra), MA (Osmania), PhD (Indian Statistical Institute)

Assistant Professors
S.C. Burdett, BA, MMath, PhD (Waterloo), J
D.G. Wagner, BSc (Simon Fraser), PhD (Massachusetts Institute of Technology)
A.S. Lewis, BA, MA, PhD (Cambridge)
B.A. Reed, BSc, PhD (McGill)

Adjunct Faculty
G.E. Andrews, BA (Oregon State), PhD (Pennsylvania)
F. Barahona, Ing (Chilo), Dr Ing (Grenoble)
J. Dennis, BS, MS (Miami), PhD (Utah)
P. Erdős, PhD (Budapest), DSc (Manchester), DMath (Waterloo, Honors Causa), Member (Hungarian Academy of Science)
L. Lovasz, Dr.Rher Nat. (Eotvos L. Budapest), Dr.Math.Sci. (Hungarian Academy of Science)
J. Nesetelii, MSc (McMaster), CSc (Charles University, Prague)
R.C. Read, BA, MA (Cambridge), PhD (London)
P.D. Seymour, BA, MSc, DPhil (Oxford)
L. Teirlinck, Licentiad, PhD (Brussels)

Faculty Members of Combinatorics and Optimization holding cross appointments to:
1 Computer Science
Faculty Members holding cross appointments to Combinatorics and Optimization from:
2 Pure Mathematics

J refers to faculty members whose primary association is with St. Jerome's College

Computer Science

Professor, Department Chair
P.A. Larson, BCon, MBA, PhD (Abo Swedish University)

Associate Professor and Associate Chair for Undergraduate Studies
F.J. Burkowski, BSc, MMath, PhD (Waterloo)

Professor and Associate Chair for Graduate Studies
R.H. Bartels, BS, MS (Michigan), PhD (Stanford)

Professors
K.S. Booth, BS (California Institute of Technology), MA, PhD (California, Berkeley) (on leave)
J.A. Brzozowski, BSc, MASc (Toronto), MA, PhD (Princeton)
S. Christodoulakis, BSc (Athens), MSc (Queen's), PhD (Waterloo) (on leave)
C.J. Colbourn, BSc (Toronto), MMath (Waterloo), PhD (Toronto) (on leave)
A.R. Conn, BSc (Imperial College), MSc (Manitoba), PhD (Waterloo)
D.D. Cowan, BSc (Toronto), MSc, PhD (Waterloo)
J.A. George, BSc, MSc (Alberta), PhD (Stanford)
R.N. Goldman, BS (Massachusetts Institute of Technology), MA, PhD (Johns Hopkins) (on leave)
G.H. Gouvêa, Cur U (Uruguay), MMath, PhD (Waterloo) (on leave)
J.W. Graham, BA, MA (Toronto), Recipient of the Distinguished Teacher Award
R.C. Mullin, BA (Western Ontario), MA, PhD (Waterloo)
J.J. Munro, BA, MA (New Brunswick), MSc (British Columbia), PhD (Toronto)
W.R. Pulleyblank, BSc, MSc (Calgary), PhD (Waterloo)
R.B. Simpson, BSc, MASc (Toronto), PhD (Maryland)
F.W. Tompa, ScB, ScM (Brown), PhD (Toronto)
S.A. Vanstone, BMath, MMath, PhD (Waterloo), J

Computer Engineering

For faculty listing consult Electrical and Computer Engineering.
University Faculty

Croatian Dance

Research Assistant Professors

E. C.-H. L. Chu, BSc, MSc (Acadia), MMath, PhD (Waterloo), NASA
N. Coburn, BMath, MMath, PhD (Waterloo), BEd (Western Ontario), ITRC
M. Sherk, BSc, MSc, PhD (Toronto) ITRC

Lecturers

B.D. Pawliwyszyn, BSc, BEd (Toronto), MS (Utah) (part-time)
A.B. Pidduck, BASc (Waterloo), PEng
D. Zilio, BMath, MMath (Waterloo), BEd (Western Ontario)
N. Zinatelli, BMath Hons (Waterloo)

Adjunct Faculty

F. Barahona, Ing. Mat. (Chile), D. Ing (Grenoble)
B.A. Barsky, BSc (McGill), MS (Cornell), PhD (Utah)
W.M. Gentleman, BSc (McGill), MA, PhD (Princeton)
J.H. Johnson, BMath, MMath, PhD (Waterloo)
J.D. Lawson, BSc (Princeton), MSc, PhD (Waterloo), FIMA
J.K. Pachl, RNDr (Prague), PhD (Waterloo)
T.M. Stephenson, BMath, MMath (Waterloo)

Faculty Members of Computer Science holding cross and/or joint appointments to:

1. Applied Mathematics
2. Electrical and Computer Engineering
3. Psychology

Faculty Members holding cross appointments to Computer Science from:

4. Combinatorics and Optimization

J refers to faculty members whose primary association is with St. Jerome's College

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Croatian

For faculty listing consult Germanic and Slavic Languages and Literatures.

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Dance

Assistant Professor, Department Chair
J. Officer, ARAD (Adv. and ATC), (London), Recipient of the Distinguished Teacher Award

Assistant Professor, Associate Chair
B. Soren, BPhE, BEd (Toronto), MSc (McMaster), PhD (Toronto)

Associate Professors
R. Priddle, BSc (McGill), MSc (Springfield), MA, PhD (Waterloo)
R. Ryman, BA, MA (York), Al Chor (London)

Lecturer
L. Prada, BSc (Waterloo), ARAD (Adv. and ATC), (London)

Guest Artist
S. Cash BFA (York)
C. Chadwick, (National Ballet School)
Drama and Theatre Arts

Associate Professor, Chair
W.R. Chadwick, BA, MA (Toronto), PhD (London)

Assistant Professor, Undergraduate Officer
M.G. van Dijk, BA, MA (Wellington), PhD (Toronto)

Associate Professor
J.S. Greenberg, BA (Sir George Williams), BEd (Toronto)

Assistant Professor, Technical Director
A. Anderson

Earth Sciences

Associate Professor, Department Chair
J.P. Greenhouse, BSc, MSc (British Columbia), PhD (California, San Diego) Recipient of the Distinguished Teacher Award

Associate Professor, Undergraduate Officer
E.C. Appleyard, BSc (Western Ontario), MSc (Queen’s), PhD (Cambridge)

Assistant Professor, Undergraduate Advisor
S. Schilt, BSc (McMaster), MA, MPhil, PhD (Columbia)

Associate Professor, Graduate Officer
D.E. Lawson, BSc, MSc (New Brunswick), PhD (Illinois)

Professors
J.A. Cherry, BE (Saskatchewan), MS (California, Berkeley), PhD (Illinois), PEng, FRSC
M.B. Dusseault, BSc, PhD (Alberta), PEng
E.O. Frind, BASc, MASc, PhD (Toronto), PEng
I.L. Gibson, BSc, PhD (Imperial College, London)
R.W. Gillham, BSA (Toronto), MSc (Guelph), PhD (Illinois)
P.F. Karrow, BSc (Queen’s), PhD (Illinois)
E.L. Matyas, BASc (Toronto), DIC, PhD (London), PEng
A.V. Morgan, BSc (Leicester), MSc (Calgary), PhD (Birmingham)
E.J. Reardon, BA (St. Francis Xavier), PhD (Pennsylvania State)

Associate Professors
J.F. Barker, BSc, MSc (McMaster), PhD (Waterloo)
S.K. Frapra, BSc, MSc, PhD (Queen’s)
J.A. Legault, BSc, MSc (Ottawa), PhD (Oklahoma)
R.G. Roberts, BA (Cambridge), MSc, PhD (McGill)
L. Rothenburg, Dipl Phy (Moscow), PhD (Carleton), PEng
E.A. Sudicky, BSc, MSc, PhD (Waterloo), PEng, NSERC University Research Fellow

Assistant Professors
M. Coniglio, BSc (McGill), MSc (Manitoba), PhD (Memorial)
T.W.D. Edwards, BSc, MSc (Queen’s), PhD (Waterloo)
M.J. Melchin, BSc, MSc (Waterloo), PhD (Western Ontario)
R.V. Nicholson, BSc (Concordia), MSc, PhD (Waterloo)
N. El Yassin, BSc, PhD (London)

Research Professors
A.P. Annan, BASc, MSc (Toronto), PhD (Memorial) (Waterloo Centre for Groundwater Research)
J.A. Franklin, BSc (Eng)(London), MSc, DIC, PhD (Imperial College, London), PEng

Research Associate Professor
B.G. Warner, BES, MSc (Waterloo), PhD (Simon Fraser)

Research Assistant Professors
E.C. Jowett, BASc, MSc, PhD (Toronto), PEng, NSERC University Research Fellow
C.W. Mase, BSc (California, San Diego), MSc (Utah), PhD (British Columbia) (Waterloo Centre for Groundwater Research)
D. Nobs, BSc, MSc, PhD (Toronto)

Adjunct Faculty
L.D. Delorme, BSc (Saskatchewan), MSc, PhD (Saskatchewan)
D.E. Elrick, BSc (Guelph), MS, PhD (Wisconsin)
D. Elsworth, BSc (Portsmouth Polytechnical College), MSc, DIC (Imperial College, London)
P. Fritz, DiplGeol, Dr. rer. nat. (Stuttgart)
F. Goodarzi, BSc (Tehran), MSc, PhD (Newcastle-upon-Tyne)
J.-M. Konrad, BSc, Dipl Ing. (Strasbourg), MSc (Laval), PhD (Alberta), PEng
B.H. Kueper, BASc, PhD (Waterloo)
D.R. Lee, BSc, MSc (North Dakota), PhD (Virginia Polytechnic Institute)
D.L. Mackay, BS, MS, PhD (Stanford)
R.W. Macqueen, BA, MA (Toronto), PhD (Princeton)
D.E. McWhorter, BSc (Colorado School of Mines), MS, PhD (Colorado State)
J.O. Nriagu, BSc (Ibadan), MSc (Wisconsin), PhD (Toronto)
H.C. Saunderson, BA (Queen’s, Belfast), MA, PhD (Toronto)
L.R. Snowdon, BSc (Calgary), PhD (Houston)
H.L. Thomas, BSc, PhD, DS (Swanse)
G. van der Kamp, BSc, MSc (British Columbia), PhD (Amsterdam)
O. White, BSc, MASc (Toronto), PhD (Illinois), PEng

Dutch

For faculty listing consult Germanic and Slavic Languages and Literatures.
Senior Demonstrators
J.L. Lang, BSc, MBA (Queen's)
K. LaHay, BSc, MSc (Guelph)

Faculty Members holding cross appointments from Earth Sciences to:
1. Civil Engineering
2. Physics
3. Biology

Faculty Member holding joint appointment with Physics

Faculty Member holding cross appointment to Earth Sciences from:
4. Civil Engineering

East Asian Studies

Adjunct Professor, Director
P. Swann, BA, MA (Oxford), LLB (Queen's), LLB (Brock), LLB (Wilfrid Laurier)

Assistant Adjunct Professor
A. Maruoka, BA (Kyoritsu, Tokyo), MEd (OISE)

Sessional Lecturer
K. Niu, BA (Beijing Institute of Foreign Languages), MA (Peking)

Economics

Professor, Department Chair
J.R. Melvin, BSc (Manitoba), MA (Alberta), PhD (Minnesota)

Associate Professor, Associate Chair, Graduate Affairs
F.M. Haqib, BSc (Washington, MSc (Oregon), PhD (Queen's)

Lecturer, Undergraduate Officer
E.W. Lau, BA (Toronto), MA (Manchester)

Professors
A.A. Andrikopoulos, BA (Athens), MA (Wayne State), PhD (Southern California)
S.K. Ghoseh, BSc, MSc (Calcutta), MS, PhD (Wisconsin)
J.H. Hotson, BA (Colorado College), MA, PhD (Pennsylvania)
M.C. Howard, BA, MA (Lancaster), PhD (Leicester)
R.R. Kerton, BComm (Toronto), MA, PhD (Queen's)
K.R. Stollery, BA (Southern California), MA, PhD (Queen's)
W.R. Thirk, BS (British Columbia), MA, PhD (Yale)
D. Wilton, BComm (McMaster), PhD (Massachusetts Institute of Technology)

Associate Professors
K.M. Bennett, BA, MA (Queen's), PhD (McGill)
R.W. Bodell, BSc (Sydney, Australia), MA, PhD (York)
J.A. Brox, BA (Toronto), MA, PhD (McMaster)
J.E. Cuenca, LIC (Madrid), MA, PhD (Western Michigan), PhD (Toronto)
L.P. Fletcher, BComm (Mount Allison), AM, PhD (Brown)
S.W. Kardasz, BA (Loyola), PhD (Queen's)
R. Kumar, BStat, MStat (Indian Statistical Institute), MA, PhD (Toronto)
W.R. Needham, BComm (Carleton), MA, PhD (Queen's)
T.T. Nguyen, BSc, ChE (California, Berkeley), MA (Simon Fraser), PhD (Western Ontario)

Assistant Professors
R.A. Androkovitch, BSc (Lethbridge), MA, PhD (Western Ontario)
E. Carvalho, BSc, MA, PhD (Waterloo)
D.J. Cox, BA (Western Ontario), PhD (Queen's)
G.M. Myers, BA (Queen's), MA (McMaster), PhD (Queen's)

E. Nosal, BA (Queen's), MA (McMaster), PhD (Queen's)
K. Reilly, BA (Dalhousie), MA, PhD (Toronto)
B. Scott, BA (Western Ontario), MA, PhD (Queen's)
G. Stirling, BMath (Waterloo), MA (Guelph), PhD (Western Ontario)

Lecturer
N.O. Bankin, BA (Bogazici), MA (McMaster)

Adjunct Lecturer
L. Smith, BA, MA (Waterloo)

Faculty Members holding cross-appointment from Economics to:
1. Accounting
2. Faculty of Environmental Studies

Electrical and Computer Engineering

Professor, Department Chair
J.A. Field, BE (Saskatchewan), MASC, PhD (Toronto), PEng

Professor, Associate Chair for Undergraduate Affairs
J.V. Hanson, BASc (Toronto), MSc, PhD (Imperial College, London), PEng

Professor, Associate Chair for Graduate Affairs
V.H. Quintana, BEng (Chile), MSc (Wisconsin), PhD (Toronto), PEng

Professor, BNR/NSERC Industrial Research Chair in Very Large Scale Integrated Circuits
M.I. Elmasry, BSc (Cario), MASC, PhD (Ottawa), PEng

Professors
J.D. Aplevich, BE (Saskatchewan), PhD (Imperial College, London), PEng
I.F. Blake, BSc, MSc (Queen's), MA, PhD (Princeton), PEng
J.A. Brzozowski, BASc, MSc (Toronto), MA, PhD (Princeton)
S.G. Chambers, BSc, MSc (Southampton)
S.K. Chaudhuri, BE (Hons), MTech (IIT/Delhi), MSc, PhD (Manitoba)
Y.L. Chow, BEng (McGill), MASC, PhD (Toronto), PEng
University Faculty
Electrical and Computer Engineering
Engineering Undergraduate Office

J.D. Cross, BSc (Wales), MS, PhD (Carleton), PEng
E.L. Heasell, BSc, PhD (Imperial College, London), PEng
S.N. Kaira, BSc (Punjab), MS, PhD (Illinois), PEng
R.H. MacPhie, BASc (Toronto), MS, PhD (Illinois)
J.W. Mark, BASc (Toronto), MEng, PhD (McMaster), PEng
R.S. Rashmak, BSc, PhD (Nottingham), PEng
H.C. Ratzi, BASc (Toronto), MS (Massachusetts Institute of Technology), PhD (Saskatchewan), PEng
J. Reave, BSc, MSc, PhD, DSc (Manchester), PEng
D.J. Rousselot, BSc (Belfast), PhD (Imperial College, London), CEng
R.G. van Heeswijk, Jr (Delft, Holland), PEng, Recipient of the Distinguished Teacher Award, (Retired)*
J. Vlach, Dipl Ing CSc (Technical University of Prague), (Retired)*
L.A.K. Watt, BSc (Manitoba), MS (Chicago), PhD (Minnesota), (Retired)*
L.Y. Wei, BS (National Northwestern College, China), MSc, PhD (Illinois), (Retired)*
J.W. Wong,† BS, MS, PhD (California-Los Angeles)
M.M. Yovanovich‡ BSc (Queen’s), MS (Buffalo), ME, ScD (Massachusetts Institute of Technology)

Associate Professors
G.B. Agnew, BASc, PhD (Waterloo), PEng
P.P. Dasiewicz, BSc, MSc, PhD, (Waterloo), PEng
A.J. Heunis, BSc (Witwatersrand), MSc, PhD (Imperial College, London)
W.M. Loucks, BASc (Waterloo), MASc, PhD (Toronto), PEng
M.M.A. Salama, BASc, MSc (Carlo), PhD (Waterloo)
R.E. Seviora, Dipl Ing (Czech Technical University), PhD (Toronto), PEng
A. Vannocci, BSc, MSc (Condoria), PhD (Waterloo), NSERC University Research Fellow
W.J. Wilson, BE, MSc (Saskatchewan), PhD (Cambridge), PEng

Assistant Professors
J. Barby, BTech (Ryerson Polytechnical), MASc, PhD (Waterloo)
L. Deng, BS (University of Science and Technology, China), MS, PhD (Wisconsin, Madison)
G.H. Freeman, BASc, PhD (Waterloo)
W.P. Huang, BS (Shandong, China), MS (University of Science and Technology, China), PhD (Massachusetts Institute of Technology)
B.H. Leung, BS (New York), MS (California), PhD (California, Berkeley)
A. Nathan, BSc Hon (Leeds Polytechnic, UK), MSc, PhD (Alberta)
G.K.H. Pang, BSc (London), PhD (Cambridge)
B.R. Preiss, BASc, MASc, PhD (Toronto), PEng
C.R. Selvakumar, BE (Madras), MTech (IIT/Bombay), PhD (IIT/Madras)
D.W.L. Wang, BE (Saskatchewan), MASc, PhD (Waterloo)

Research Assistant Professor
S.T. Chu, BSc (Wilfrid Laurier), MSc PhD (Waterloo)

Adjunct Faculty
R. Bartnikas, BASc (Toronto), MEng, PhD (McGill)
J. Kuffel, BASc (Windsor), MASc, PhD (Waterloo), PEng
J. Li,‡ BSc, DipEd (Hong Kong), DSc (Laval)

Laboratory Director
R.L. Wright, PEng
Faculty Members holding cross appointment to Electrical and Computer Engineering from:
1Computer Science
2Physics, Wilfrid Laurier University
3Mechanical Engineering
* Also has Adjunct appointment

Associate Professor
C.F.A. Beaumont,* BA (McMaster), MA (Toronto)

Directors
L.E. Bodnar,*‡ Director of Admissions, BA, MA (Saskatchewan), PhD (McMaster)
G.M. Bragg,*‡ Director of General Studies, BASc (Toronto), PhD (Cambridge), PEng
J.D. Ford,*‡ Director of First Year Engineering, BEng (McGill), MASc, PhD (Toronto), PEng
H.C. Ratzi,*‡ Director of Exchange Programs, BASc (Toronto), MS (Massachusetts Institute of Technology), PhD (Saskatchewan), PEng

Lecturers/Demonstrators
D.A. Fraser, BASc, BEd (Waterloo), Associate Professor
K. Riepert, BASc (Waterloo), Recipient of the Distinguished Teacher Award

Faculty Members holding administrative appointments in the Engineering Undergraduate Office from:
1Mechanical Engineering
2Chemical Engineering
3Electrical & Computer Engineering

Faculty Members holding cross appointments to the Engineering Undergraduate Office from:
4Applied Mathematics
University Faculty

English

Associate Professor, Department Chair
G.E. Slethaug, BA (Pacific Lutheran), MA, PhD (Nebraska)

Professor, Associate Chair and Undergraduate Officer
W.R. Macnaughton, BA (Toronto), MA, PhD (Wisconsin)

Associate Professor, Associate Chair and Graduate Officer
N.C. Hultin, BA (Concordia), MA (Chicago), PhD (Johns Hopkins)

Associate Professor and Co-operative Education Officer
R.N. Gosselink, BA (Kansas), MA, PhD (Colorado)

Professor Emeritus
G.R. Hibbard, BA, MA (London), DLitt (Waterloo)

Professors
L.A. Cummings,1 AB (Washington), AM (Missouri), PhD (Washington), Recipient of the OCUFA (Ontario) Teaching Award
S. Fogel, BA (Carleton), MA (British Columbia), PhD (Purdue), R
J. Gold, BA (Birmingham), PhD (Wisconsin)
J.C. Gray, BA (Washington State), MA (Connecticut), PhD (Syracuse), (Retired)
K.L. Laddstaw, AB (Central College, Mo.), MA, PhD (Illinois), Recipient of the Distinguished Teacher Award
D.R. Letson, BA (Waterloo), MA (McMaster), PhD (Toronto), J, Recipient of the Distinguished Teacher Award
C.F. MacRae, BA (Western Ontario), MA (McMaster), PhD (Toronto), (Retired)*
W.R. Martin, BA, MA, D Lit et Phil (South Africa), Recipient of the Distinguished Teacher Award, (Retired)*
W.U. Ober, BA (Washington and Lee), PhD (Indiana)
P.H. Smith, Jr., BA (Harvard), PhD (Pennsylvania), (Retired)*
W.K. Thomas, MA, PhD (Toronto)

Associate Professors
P.D. Beam, BA (Waterloo), MA (McMaster), PhD (Toronto)
R.R. Dubinski, BA, MA (Western Ontario), PhD (Toronto)
A.I. Dust, MA, PhD (Illinois), (Retired)*
H.B. Ellis, BA (Rutgers), MA, PhD (Illinois)

M.W. Higgins,2 BA (St. Francis Xavier), MA, PhD (York), J
P.M. Hinchcliffe, BA (British Columbia), MA, PhD (Toronto), J
R. Lister, BA, MA, PhD (Toronto)
H.M. Logan, AR (Franklin and Marshall), PhD (Pennsylvania)
A.L. Magnusson, BA (Manitoba), MA, PhD (Toronto)
E.P. McCormack, MA (Glasgow), PhD (Manitoba), J
C.E. McGee, BA, MA, PhD (Toronto), J
S.E. McKinnon, BA, MA (Carleton), PhD (Dalhousie)
J.H. Miller, BA, BLS (McGill), MA, MPhil (Waterloo), PhD (York), R
J.S. North, BA, MA (British Columbia), PhD (Alberta)
N.F. Randall, BA (Guelph), MA (Waterloo), PhD (York)
E.F. Shields, AB (Cheestnut Hill), MA (Villanova), PhD (Illinois)
J.S. Stone, BA, MA (British Columbia), (Retired)*
H. Froese Tiessen, BA (Winnipeg), MA, PhD (Alberta), G

Assistant Professors
L. Dorney, BA, MA, (Louisville), J
M.A. Gerhardstein, BA, MA (Montana), PhD (Iowa)
D.G. Goodwin, BA, MA, PhD (Toronto)
M.G. McArthur, BA (Manitoba), MA, PhD (Western Ontario)
J.Z. Segal, BA (McGill), MA, PhD (British Columbia)
K. Weisman, BA (Winnipeg), MA, PhD (Toronto)

Adjunct Faculty
C.A. Redmond, BA (Queen’s), MA (Waterloo)

Faculty Members holding cross appointments to English from:
1Architecture
2Religious Studies

*Also has Adjunct appointment

G refers to faculty members at Conrad Grebel College
J refers to faculty members at St. Jerome’s College
R refers to faculty members at Renison College

Environment and Resource Studies

Associate Professor, Department Chair
J.E. Robinson, BSc (Waterloo), MES (York), PhD (Michigan)

Associate Professor, Undergraduate Officer
S.C. Lerner, BA (Ohio State), MA (Columbia), Recipient of the Distinguished Teacher Award

Professors
M. Chandrashekar,3 BTech (Indian Institute of Technology, Kanpur), BSc, PhD (Waterloo), PEng
G.R. Francis, BA (Toronto), BA (McGill), MA (British Columbia), PhD (Michigan)
W.B. Kandrick,2 BSc, PhD, DSc (Liverpool), FRSC
S. Kumar, BSc, MSc (Punjab), MA, PhD (Toronto)

Assistant Professors
R.B. Gibson, BA (York), MA, PhD (Toronto)
R.F. Keith, BSA (Guelph), MA, PhD (Michigan State)
G.B. Priddle, BA, (Western Ontario), MA, PhD (Clark)
J.B. Robinson,1 BA (Toronto), MES (York), PhD (Toronto)

Assistant Professors
J.J. Kay,2 BASc (McGill), MASC, PhD (Waterloo)
M.C. Delfgaauw-Kesik4 B Econ
(Ansterdam), MA, PhD (Waterloo)
G.O. Michalenko, BA, PhD (Saskatchewan)

Adjunct Faculty
F. Glew, BA (Waterloo Lutheran), BEd (Toronto), MSciEd (Niagara), PhD (Columbia)
J. Jackson, BA (Windsor)
B. Savan, BSc (Toronto), PhD (London)

Faculty Members of Environment and Resource Studies holding cross and/or joint appointments to:
1Geography
2Systems Design Engineering
3Environmental Studies
4Biology

Faculty Members holding cross and/or joint appointments to Environment and Resource Studies from:
Environmental Studies

The following persons have wide ranging interests and hence have been appointed to the Faculty of Environmental Studies rather than to a specific Department and/or School:

Professors

P.J. Howarth,1 BA (Cambridge), PhD (Glasgow)
C.K. Knapper,2 BA Hons (Sheffield), PhD (Saskatchewan)
P.H. Nash, BA, MA (California, Los Angeles), CE (Grenoble), MCP, MPA, PhD (Harvard), MCIP, AICP, (Retired)

Associate Professors

G.B. Hall,1,3 BA Hons (Otago, New Zealand), MA, PhD (McMaster)
R.T. Newkirk,4 BA, MSc, PhD (Western Ontario)

Assistant Professors

E. Carvalho,4 BA, MA, PhD (Waterloo)
M.C. Delfgaauw-Kesik5 BEcon (Amsterdam) MA, PhD (Waterloo)

Adjunct Faculty

C.R. Bryant, BA, PhD (London)
W. Buck, BASc (Toronto)
K. Elliott, Diploma Creative Arts
S. Garrod,6 BA (McMaster), LLB, MES (York)
L.O. Gertler, BA (Queen's), MA (Toronto), FCIP

Faculty Members of Environmental Studies holding cross appointments to:

1Geography
2Psychology, Geography and Planning
3Planning
4Environment and Resource Studies

Faculty Members holding cross appointments to Environmental Studies from:

5Planning
6Economics

7Faculty Member holding joint appointment with Planning.

Fine Arts

Associate Professor, Department Chair

D.I. MacKay, BFA (Mt. Allison), MFA (Cornell)

Assistant Professor, Undergraduate Officer

J.G. Buyers, BFA (York), MEd (Toronto)

Professors

V. Burnett, BS (Columbia), MA (California, Berkeley)
P.Y. Forsyth,1 AB (Mount Holyoke), MA, PhD (Toronto), Recipient of the Distinguished Teacher Award
N.L. Patterson, BA (Washington)
A.M. Urquhart, BFA (Buffalo)

Associate Professors

M.S. Bird,2 BA, MA, PhD (Iowa), R
A.N. Green, BFA (Art Institute of Chicago), Recipient of the Distinguished Teacher Award
E. Kliman, MA, PhD (Toronto)
A. Roberts, BA (Guelph), MA (Claremont)
J. Uhde, MA (Masaryk University Brno), PhD (Waterloo)

Faculty Members holding cross appointments to Fine Arts from:

1Classical Studies
2Religious Studies

R refers to faculty member at Renison College.

French

Professor, Department Chair

D.W. Russell, BA, MA, PhD (Toronto)

Assistant Professor, Associate Chair and Undergraduate Officer

R.J. Fournier, BA, MA, PhD (Western Ontario)

Associate Professor, Graduate Officer

H.S. Fournier, BA (Toronto), MA, PhD (Western Ontario)

Professor

A. Ages, BA (Carleton), MA, PhD (Ohio State)

Associate Professors

C.A. Abbott, BA, MA, PhD (Ohio State), J
P.H. Dubu, BA, MA (Toronto), PhD (Ohio State)
J.R. Dugan, BA, MA (Toronto), PhD (Yale)
R.W. Ryan, BA, MA (Dalhousie), Doctorat de 3e cycle (Université de Provence)
P.G. Soeken, BA (Toronto), MA (Iowa), PhD (Toronto)
W.D. Wilson, MA, PhD (Trinity College, Dublin)

Assistant Professor

J-P. Beaulieu, BA (Sherbrooke), MA (Waterloo), PhD (Ottawa)

Lecturer

J. Ainsworth, BA (Wilfrid Laurier), MA (New Brunswick), DEA (Aix-en-Provence)

Language Instructors

P. Aplevich, BA, MA (Waterloo)
C. Black, Licence ès lettres (Grenoble), MA (Waterloo)
L. Chaput, BA, MA (Laval)
H. McLennan, Licence en Phil. Rom. (Brussels), MA (Waterloo), PhD (Western Ontario)
T. Sabaryn, Licence ès lettres (Toulouse), Recipient of the Distinguished Teacher Award

J refers to faculty members at St. Jerome's College
French Language (Studies in the)

Associate Professor, Director
C.C. Abbott, BA, MA, PhD (Ohio State)

Participating Faculty
Associate Professors
P.H. Dubé, BA, MA (Toronto), PhD (Ohio State), French
R.J. Fournier, BA, MA, PhD (Western Ontario), French

Assistant Professors
J-P. Beaupré, BA (Sherbrooke), MA (Waterloo), PhD (Ottawa), French
B. Singer, BA, MA (Toronto), PhD (Washington), History

Language instructors
C. Black, Licences ès lettres (Grenoble), MA (Waterloo), French
T. Sabaryn, Licences ès lettres (Toulouse), French

Teaching Fellow
C. Normande, BA (Ottawa), MA (UQAM)

Geography

Associate Professor, Department Chair
R.A. Bullock, BA, MA (Belfast), PhD (London)

Associate Professor, Associate Chair
Undergraduate Studies
A.B. Kesik, MA, PhD (UMCS, Lublin, Poland)

Associate Professor, Associate Chair
Graduate Studies
C. Dufourmaud, BA (Sir George Williams), MA (Laval), PhD (Toronto)

Professors
J.H. Bater, BA, MA (British Columbia), PhD (London)
A. Diem, BA (Wayne State), MA (Clark), PhD (Michigan)
J.S. Gardner, BSc (Alberta), MSc, PhD (McGill), Recipient of the Distinguished Teacher Award
L.T. Guelke, BSc (Cape Town), MA (York), PhD (Toronto)
P.J. Howarth, BSc (Cambridge), PhD (Glasgow)
C.K. Knapper, BSc Hons (Sheffield), PhD (Saskatchewan)

R.R. Kueger, BA MA (Western Ontario), PhD (Indiana), Recipient of the Distinguished Teacher Award, (Retired)*
E.F. LeDraw, BA (Toronto), MA, PhD (Colorado)
G.R. McBoye, BSc, PhD (Aberdeen), Recipient of the Distinguished Teacher Award
A.G. McLeilian, BSc, PhD (Glasgow)
W.B. Mitchell, BA, MA (British Columbia), PhD (Liverpool)
G.G. Mulamuottii, BSc (Mysore), MSc (Bombay), PhD (Delhi)
P.H. Nash, BA, MA (California, Los Angeles), CE (Grenoble), MCP, MPA, PhD (Harvard), MCIP, AICP, (Retired)
J.G. Nelson, BA (McMaster), MA (Colorado), PhD (Johns Hopkins)
R.E. Preston, BA (Central Washington), MA (Washington), PhD (Clark) MA, PhD (Toronto)
J.B. Theberge, BScA (Guelph), MSc (Toronto), PhD (British Columbia)
G. Wall, BA, MA (London), MSc, PhD (Hull)

Geological Engineering

Professor, Chair of the Geological Engineering Board
E.L. Metys, BASc (Toronto), DIC, PhD (London), PEng

Members of the Board of Geological Engineering

Professor, Dean of the Faculty of Engineering, Department of Mechanical Engineering
D.J. Burns, BSc, PhD (Bristol), PEng, CEng

Professor, Department of Civil Engineering
W.C. Lennox, BASc, MSc (Waterloo), PhD (Lehigh), PEng

Professor, Department of Civil Engineering Chair
G.J. Farquhar, BASc (Waterloo), PhD (Wisconsin), PEng

Associate Professor, Department of Earth Sciences Chair
J.P. Greenhouse, BSc, MSc (British Columbia), PhD (California)

Professors, Department of Earth Sciences
J.A. Cherry, BE (Saskatchewan), MS (California, Berkeley), PhD (Illinois), PEng
M.B. Dusseauit, BSc, MSc, PhD (Alberta), PEng
P.F. Karrow, BSc (Queen's), PhD (Illinois)

Associate Professors, Department of Civil Engineering
B. LeLievre, BEng (West Australia), MASc, PhD (Waterloo), PEng
L. Rothenburg, Dipl Phy (Moscow),
PhD (Carleton), PEng

J.C. Thompson, BASc (Toronto), MS,
PhD (Illinois), PEng

Associate Professor, Department of
Earth Sciences

S.K. Frate, BSc, MSc, PhD (Queen's)

Assistant Professor, Department of
Earth Sciences

N. El Yassir, BSc, MSc, PhD (London)

Research Professor

J.A. Franklin, BSc, MSc, PhD (London),
PEng

Assistant Professors

Z. Gimpelevich-Schwartzman, MA
(Minsk, USSR), PhD (Ottawa)

H. Moysich, Staatsexamen (Heidelberg),
Dr phil. (Mainz), Visiting Assistant
Professor (DAAD)

H. Nabbe, BA, MA, PhD (Toronto)

I. Szarycz, MA (Poland), PhD (Ottawa)

Adjunct Faculty

R. Kooistra, BTh (Kampen), Doctorandus of
Theology, DTh (Free University of Amsterdam)

Gerontology

Professor, Director of the Program
W.F. Forbes, BSc, PhD, DSc (London),
DUC, ARCS, Statistics and Actuarial
Science

Committee Members
Associate Professors, Undergraduate
Officers

J.C. Carlson, BSc, MSc, PhD (Massachusetts),
Biology

N.H. Charness, BA (McGill), MS, PhD
(Carnegie-Mellon), Psychology

Associate Professor, Part-time Studies
Officer

P. Naus, BA, PhD (Nijmegen, Netherlands),
J. Psychology

Professors

H.S. Coble, BA Hons (Durham),
MRP (North Carolina), FRTP, AICP,
FSS, MIES, Urban and Regional
Planning

D.A. Winter, BSc, MSc (Queen's), PhD
(Dalhousie), PEng, Kinesiology

Associate Professor

J.E. Curtis, BA (Sir George Williams),
MA (Central Michigan), MA (Cornell),
Sociology

Clinical Faculty

R. Pace, OD (Waterloo), FAAO

Adjunct Faculty

L. Caldwell, BA (Pennsylvania State),
MS (North Carolina State), PhD
(Maryland)

J.F. Gentleman, BA, MS (Chicago),
PhD (Waterloo)

J.P. Hirdes, BSc, MA, Diploma in
Gerontology, PhD (Waterloo)

J.A. Jackson, MA, MB, BChir
(Cambridge)

C. Kluck Davis, BA (Western Ontario),
MA (McMaster)

B.D. McPherson, MA (Western
Ontario), PhD (Wisconsin)

C.W. Schwenger, MD, DPH (Toronto)

Greek

For faculty listing consult Classical
Studies

Health Studies

Associate Professor, Department Chair
D.E. Mills, BSAg (Purdue), PhD
(Indiana) Recipient of the Distin-
guished Teacher Award

Associate Professor, Associate Chair,
Graduate Affairs

A.M. Myers, BA (Winnipeg), MA, PhD
(York)

Associate Professor, Associate Chair,
Undergraduate Affairs

J.A. Jackson, MA, MB, BChir
(Cambridge)

J. Randall Simpson, BSc (Toronto),
PhD (Queph)
Research Associate and Lecturer
R. Walker, BSc, MSc (Western Ontario)

Adjunct Faculty
J. D'Avernas, BSc, MSc (Waterloo)
B. Ebbesen, BPE (McMaster), MSc (Waterloo)
S. Evers, BSc (Ottawa), MSc (Cornell), PhD (Western Ontario)
V. Huang, BSc (National Taiwan University), MSc (Notre Dame), PhD (Fordham)
A.E. LeBlanc, BA (Queen's), MSc, PhD (Toronto)
R.J. Sax, BSc (Toronto), MD (British Columbia), MD (Toronto)
N.F. White, MDCM, DPsych (McGill), FRCP (C) (Royal College)
C.L. Young, BSc (Guelph), MSc (Western Ontario)

Faculty Members of Health Studies holding cross appointments to:
1Psychology
2Statistics
3Kinesiology

Faculty Members holding cross or joint appointments to Health Studies from:
4Kinesiology
5Psychology
6Statistics
7Biology

History

Associate Professor, Department Chair
D.A. Davies, BA, PhD (Washington), Recipient of the Distinguished Teacher Award

Associate Professor, Undergraduate Officer
K.D. Eagles, BA (Cambridge), MA, PhD (Washington)

Professors
M.J. Crooton, BA (London), MA, PhD (McMaster) FRHistS
J.R. English, BA (Waterloo), AM, PhD (Harvard)
N. Forayth, AB (Mount Holyoke), MA, PhD (Toronto), Recipient of the Distinguished Teacher Award
L.T. Gueltke, BSc (Cape Town), MA (York), PhD (Toronto)
P.J. Harrigan, BA (Detroit), AM, PhD (Michigan)
K.M. McLaughlin, BA (Waterloo), MA (Dalhousie), PhD (Toronto), J
R.C. MacGillivray, BA (Queen's) AM, PhD (Harvard)
J.F.H. New, BA, MA (Melbourne), PhD (Toronto), FRHistS

Associate Professors
N.R. Ball, BA (McMaster), MA, PhD (Toronto)
R.L. Fowler, BA, MA (Toronto), DPhil (Oxford)
S.K. Johannesen, BA (Evangel College), MA, PhD (Missouri)
M.T. Malone, BA (National University of Ireland, Dublin), BEd, MA, PhD (Toronto), J
W.L. Mitchinson, BA, MA, PhD (York)
W.O. Packull, BA (Guelph), MA (Waterloo), PhD (Queen's), G
E.P. Patterson, BA (Baylor), MA (Kansas), PhD (Washington)
R. Sawatsky, BChEd (CMBC), BA (Bothel College), MA (Minnesota), MA, PhD (Princeton), G
C.A. Snyder, BA (Waterloo), MA, PhD (McMaster), G
J.A. Wahl, CR, BA (Western Ontario), MA, PhD (St. Louis), J
J.W. Walker, BA (Toronto), MA (Waterloo), PhD (Dalhousie)

Assistant Professors
S.L. Ager, BA, MA (Queen's), PhD (British Columbia)
L.A. Curchin, BA (Western Ontario), MA (Toronto), MA (Carleton), PhD (Ottawa)
L.G. Friesen, BA (Waterloo), MA, PhD (Toronto), G

Independent Studies

Associate Professor, Director
G.A. Griffin, BA (Colgate), MA, PhD (Wisconsin), Recipient of the Distinguished Teacher Award

Associate Professors
P.D. Beam, BA (Waterloo), MA (McMaster), PhD (Toronto)
I.E. Bunting, BA (York), MA (Western Ontario), PhD (Toronto)

Academic Advisor
A.I. Dagg, BA, MA (Toronto), PhD (Oxford)

Academic Board Members
Associate Professor, Academic Board Chair
P.H. Holmes, BA, MA (Montana), PhD (Washington)

Professors
J. Gold, BA (Birmingham), PhD (Wisconsin)

Associate Professors
P.E. Bowers, BA (Queen's), MA, PhD (Illinois)
S.C. Lerner, BA (Ohio State), MA (Columbia), Recipient of the Distinguished Teacher Award
D.J. Taylor, BSc (Saskatchewan), MMath, PhD (Waterloo)
J. Vanderkooy, BEng, PhD (McMaster)

Assistant Professor
J.A. Robinson, BSc (Durham), MSc, PhD (Essex)

Interdisciplinary Social Science

For faculty listing consult Social Development Studies

International Studies

Professor, Director
J. English, BA (Waterloo), AM, PhD (Harvard)

Advisory Board
Associate Professors
J.W. Walker, BA (Toronto), MA (Waterloo), PhD (Dalhousie)
D.I. Sahas, BA (Athens), STM (Christian Theological Seminary), PhD (Hartford Seminary Foundation)

Assistant Professor
R.J.R. Mathies, BA (Waterloo), MA (Guelph), EdD (Toronto)

Kinesiology

Professor, Department Chair
P.J. Bishop, BSc, BPE (Waterloo), MSc (Western Illinois), PhD (Minnesota)

Associate Professor, Associate Chair, Undergraduate Affairs
I.D. Williams, MS, PhD (Illinois)

Associate Professor, Associate Chair, Graduate Affairs
A.E. Patla, BTech (Indian Institute of Technology), MSc Eng (New Brunswick), PhD (Simon Fraser)

Associate Professor, Head of School of Anatomy
D.A. Ranney, BA, MD (Toronto), FRCS (England)

Professors
N.J. Ashton, BSc (McGill), MS (Michigan)
J.E. Curtio, BA (Sir George Williams), MA (Central Michigan), MA (Cornell)
H.J. Green, BA, BPHE (Queen's), MA (Alberta), PhD (Wisconsin)
M.E. Houston, BSc (Toronto), PhD (Waterloo)
R.L. Hugson, BSc (Western Ontario), MSc (British Columbia), PhD (McMaster)
R.G. Marteniuk, BPE, MA (Alberta), EdD (California, Berkeley)
R.W. Norman, BA, BPE (McMaster), MSc (Alberta), PhD (Pennsylvania State), Dr.h.c. (Jyväskylä)
D.A. Winter, BSc, MSc (Queen's), PhD (Dalhousie), PEng

Associate Professors
F. Allard, BA, BPE, PhD (Waterloo), Recipient of the Distinguished Teacher Award
L.R. Brawley, BPE (Calgary), MSc (Oregon), PhD (Pennsylvania State)
N. Charness, BA (McGill), MS, PhD (Carnegie-Mellon)
L. Hoffman-Goetz, BA (SUNY-Binghampton), MA, PhD (Michigan)
C.L. MacKenzie, BSc, MSc, PhD (Waterloo)
E.A. Roy, BSc (Waterloo), MPE (British Columbia), PhD (Waterloo)
M.T. Sherratt, BA, MA (Western Ontario), PhD (Wisconsin)
N. Theberge, BA (Massachusetts), MA (Boston), PhD (Massachusetts)
J.A. Thomson, BA, MSc (McMaster), PhD (Waterloo)
R.P. Wells, BSc (Manchester), MEng (McMaster), PhD (Manchester)
W.N. Widmeyer, BPE (Western Ontario), BPE (McMaster), BPE (California), PhD (Illinois)

Assistant Professors
J.S. Frank, BSc, MSc (Waterloo), PhD (Southern California)
S.M. McGill, BPE (Toronto), MSc (Ottawa), PhD (Waterloo)

Research Assistant Professors
J.M. Kowalchuk, BSc, MSc (Waterloo), PhD (McMaster)
B. Sivak, BPT (McGill), MSc, PhD (Waterloo)

Adjunct Faculty
J.S. Birch, BSc, MSc, PhD (Waterloo)
D.B. Couch, BES (Waterloo), MEng (Toronto), C.I.H., R.O.H.
G.H. Mann, MB, BS (London), DRCP (London)
P.J. Plyn, BSc (Calgary), MEng (Waterloo, Ontario), PhD (Waterloo)
S. Prasad, BSc (Waterloo), MD (McMaster), FRCP (Canada)

Laboratory Demonstrators
B. Farrance, BSc, MSc (Waterloo)
L.L. Jones, BSc, MSc (Waterloo)
J.S. Larkworthy, BSc (Waterloo)
D.C. Painter, BA, BPHE (Queen's), MSc (Waterloo)
J.C. Pezzack, BSc, MSc (Waterloo)
C. Russell, BSc (Waterloo)
H.E. Scoggan, BA, MSc (Queen's)

Faculty Members of Kinesiology holding cross and/or joint appointments to:
1Sociology
2Psychology
3Systems Design

University Faculty
Interdisciplinary Social Science — Kinesiology
Latin

For faculty listing consult Classical Studies.

Latin American Studies

Assistant Professor, Director
M. Gutiérrez, BA, MA (McGill), PhD (Laval)

Professor
M.J. Craton, BA (London), MA, PhD (McMaster), FRHistS

Associate Professor
A. Fama, BA (Brock), MA (Western Ontario), PhD (SUNY at Buffalo)

Assistant Professors
T. Korovkin, BA, MA (Moscow), MA, PhD (York)
G.A. Snyder, BA (Waterloo), MA, PhD (McMaster), G

G refers to faculty members at Conrad Grebel College

Legal Studies

Committee Members
Associate Professor, Director
C.G. Brunk, BA (Wheaton), MA, PhD (Northwestern), G

Associate Professors
P.J. Carrington, BA (Harvard), MA, PhD (Toronto)
F.G. Reynolds, BSc, MSc (Manitoba), FSA, FCIA, MAAA
J.A. Wahl, CR, BA (Western Ontario), MA, PhD (St. Louis), J

Assistant Professors
S.P. Gunz, BA, LLB (Sydney), MBA (Manchester)
R.P. Woolstencroft, BA, PhD (Alberta)

Adjunct Faculty
S.R. Garrod, BA (McMaster), LLB, MES (York)

G refers to faculty members at Conrad Grebel College

J refers to faculty members at St. Jerome’s College

Management Sciences

Professor, Department Chair
M.J. Magazine, BS (City College of New York), MS (New York University), MEng, PhD (Florida), PEng

Associate Professor, Associate Chair for Undergraduate Studies
J.B. Moore, BASc (Toronto), MMath, PhD (Waterloo), PEng

Associate Professor, Associate Chair for Graduate Studies
R.G. Vickson, BSc (British Columbia), PhD (Massachusetts Institute of Technology)

Associate Professor, NSERC/SSHRC Research Chair in the Management of Technological Change (Co-sponsored by BNR and BCTel)
P.D. Guild, BA (Waterloo), MA (Ottawa), DPhil (England)

Professors
J.H. Bookbinder, MBA (Toronto), MS, PhD (California, San Diego)
J.A. Buczaco, BSc, BE (Sydney), MSc, PhD (Birmingham)
D.W. Conrath, BA (Stanford), MS (Carnegie Tech), MA, PhD (California, Berkeley), PEng
S.D. Saleh, BA (Cairo), MA, PhD (Case Western Reserve)
G.N. Soulsi, 1 BASc (Toronto), PEng

Associate Professors
I. Bernhardt, BA (New York), PhD (California, Berkeley)
D.M. Ditto, BS (California Polytechnic), MBA, PhD (Oregon)
N.M. Fraser, BASc, MASc, PhD (Waterloo), PEng
J.D. Fuller, BSc (Queen’s), MSc, PhD (British Columbia)
Y. Garchak, BA, MSc (Tel-Aviv), PhD (British Columbia)
F. Satayen, BS (Idaho), MSc, PhD (Victoria)

Assistant Professors
E.M. Jewkes, BSc (St. Francis Xavier), MBA (Calgary), PhD (Waterloo)
V. Mason, BASc, MASc (Toronto), PhD (Waterloo), PEng, (Retired)*
M.M. Tombak, BASc, MBA (Toronto), MA, PhD (Pennsylvania)

Lecturer
C.G. Blake, BASc (Waterloo), MS (Johns Hopkins), PEng

Adjunct Faculty
C.R. Harris, BMath, MASc, PhD (Waterloo)
G.C. Hughes, MA (Toronto)

Associate Director of Waterloo Management of Integrated Manufacturing Systems Research Group (WATMIMS)
M. Hoojs, BASc (McMaster), MASc (Waterloo)

Faculty Member of Management Sciences holding cross appointment to:
1Systems Design Engineering

*Also has Adjunct appointment
Management Studies

Associate Professor, Course Director, and Undergraduate Officer
E.S. Lucy, BA (Hobart)

Mathematics

(See also Applied Mathematics, Combinatorics and Optimization, Computer Science, Pure Mathematics, Statistics and Actuarial Science.)

Associate Professor
P.C. Brillinger, BA (McMaster), MA (Waterloo)

Lecturers, Faculty of Mathematics
L.E. Davidson, BSc (Toronto)
B.A. Ferguson, BMath (Waterloo)
R.G. Scms, BA (Western Ontario), MMath (Waterloo), (Director of Co-op Teaching)

Special Lecturer and Resident Counsel in Mathematics and Engineering
R.G. Lawrence, OC

Division of Mathematics for Industry and Commerce

Associate Dean for Faculty Programs
R.G. Dunkley, Department of Combinatorics and Optimization

Regular Members, Mathematics
C.F.A. Beaumont, Department of Applied Mathematics
C.E. Haff, Department of Combinatorics and Optimization
P.A. Larson, Department of Computer Science
P.J. Ponzo, Department of Applied Mathematics
W.R. Pulleyblank, Department of Combinatorics and Optimization
G.E. Weddell, Department of Computer Science
J.B. Whitney, Department of Statistics and Actuarial Science
H. WoIokowicz, Department of Combinatorics and Optimization

Regular Members, University
J.R. Hanna, School of Accountancy
R.A. Klawitter, Co-operative Education and Career Services
M.J. Magazine, Department of Management Sciences

Mathematics Electives

For faculty listing consult Mathematics.

Mechanical Engineering

Professor, Department Chair
H.F. Sullivan, BASc (Waterloo), AM, PhD (Princeton), PEng

Professor, Associate Chair
A.B. Strong, BASc (Waterloo), MSc (Imperial College), PhD (Waterloo), PEng

Professors
K.G. Adams, BASc (Queen's), MASc, PhD (Waterloo), PEng
G.C. Andrews, BASc, MASc (British Columbia), PhD (Waterloo), PEng
G.M. Bragg, BASc (Toronto), PhD (Cambridge), PEng
E. Brundrett, BSc (Toronto), MSc (Queen's, Kingston), PhD (Waterloo), PEng
D.J. Burns, BSc, PhD (Bristol), PEng, CEng
R.N. Dubey, BSc (Hons) (Patna), BSc (Eng) (Bihar), PhD (Waterloo), PEng
K.G.T. Hollands, BASc, MSc (Tokyo), PhD (McGill), PEng, FCISME
J.H.G. Howard, BSc (Queen's), MSc, PhD (Birmingham), PEng
W.H. Hui,^2 BSc (Peking), PhD, DSc (Southampton), PEng
H.W. Kerr, BASc, MSc, PhD (Toronto), PEng
J.G. Lenard, BASc, MSc, PhD (Toronto), PEng
P. Niessen, BSc (McMaster), MASc, PhD (Toronto), PEng
R.J. Pick, BASc (Queens, Kingston), MSc (Waterloo), PEng
A. Plumtree, BSc. PhD (Nottingham), PEng, CEng, FIM
G.D. Raithby, BSc, MSc (Western Ontario), PhD (Minnesota), PEng, Recipient of the Distinguished Teacher Award

G.E. Schneider, BASc, MASc, PhD (Waterloo), PEng
P.R. Siewem, BASc, MASc, PhD (Waterloo), PEng
M.M. Yovanovich,^1 BSc (Queen's), MS (Buffalo), ME, ScD (Massachusetts Institute of Technology), FAAA, FASME

Associate Professors
G.A. Davidson, BASc, PhD (Toronto), PEng
G. Glinka, MSc, PhD, DSc (Warsaw Technical University)
A.M. Hale, BSc, MA (New Brunswick), BASc (Toronto), MSc, PhD (Waterloo), PEng
F.M. Ismail, BSc, MSc (Alexandria), PhD (McMaster)
M. Renkstibutit, BSc (Robert College), MSc (Middle East Technical), PhD (North Western), PEng
G.D. Stikleley, BASc (Waterloo), MSc (Stanford), PhD (Waterloo), PEng
R.A. Varin, MSc, PhD (Warsaw Technical)

Assistant Professors
S. Bedi, BTech (ITT, Kanpur), MASc (British Columbia), PhD (Victoria)
R.A. Fraser, BSc (Queen's, Kingston), MA, PhD (Princeton)
M.F. Gohar, BSc, MSc (Wales), PhD (Wales), PEng
S. H. Dallimore, BSc, MSc, PhD (Waterloo), PEng
D.C. Weckman, BASc, MSc, PhD (Waterloo), PEng
E.J. Weckman, BSc, MSc, PhD (Waterloo)

Research Assistant Professor
A.P. Brunger, BASc, ME, PhD (Toronto), PEng
S. Lee, BASc, MASc, PhD (Waterloo)

Adjunct Faculty
C.J. Beigegssmer, BSc, MASc, PhD (Waterloo), PEng
T.A. Brzustowski, BASc (Toronto), AM, PhD (Princeton), PEng
R.G.R. Lawrence, OC
U.H. Mohaupt, BASc, MASc, PhD (Waterloo), PEng
J.A. Schey, Dipl Ing, CSc (Budapest), Dr. Ing. h.c. (Stuttgart), Dr. Ing. h.c. (Miskolc), FASM, FSM, PEng (Retired)

Laboratory Director
M. Kaptain, Dipl Ing (Holland), MASc (Waterloo)
Middle East Studies

Associate Professor and Director
D. J. Sahas, BA (Athens), STM (Indianapolis), PhD (Hartford), Department of Religious Studies

Associate Professor and Assistant Director
L. A. Curchin, BA (Western Ontario), MA (Toronto), MA (Carleton), PhD (Ottawa), Department of Classical Studies

Professors
A. Banerji, BArch (Calcutta), MArch (North Dakota State), School of Architecture
A. Diem, BA (Wayne State), MA (Clark), PhD (Michigan), Department of Geography
M. I. Elmasry, BSc (Cairo), MASC, PhD (Ottawa), PEng, Department of Electrical and Computer Engineering
W. Kissman, BA, BEd (Goshen), PhD (Princeton)
J. W. Miller, BA (Goshen), MA (New York), BD (Princeton), ThD (Reisel), G, Department of Religious Studies

Associate Professors
F. M. Naqib, BSc (Washington), MSc (Oregon), PhD (Queen's), Department of Economics
J. S. North, BA, MA (British Columbia), PhD (Alberta), Department of English

Resource Persons
Professors
V. K. Handa, BSc (Calcutta), BSc (Eng) (London), MSc (Queen's), MASC, PhD (Waterloo), PEng, Department of Civil Engineering
W. C. Lennox, BASc, MSc (Waterloo), PhD (Lehigh), PEng, Dean of Engineering
S. D. Saleh, BA (Cairo), MA, PhD (Case Western Reserve), Department of Management Sciences

G refers to faculty members at Conrad Grebel College

University Faculty
Middle East Studies — Optometry

Music

Associate Professor, Department Chair
W. R. Maust, BS (Eastern Mennonite College), BMus (Peabody Conservatory), MMus, PhD (Indiana)

Associate Professors
L. J. Enns, ARCT (Toronto), BSM (Canadian Mennonite Bible College), BMus (Wilfrid Laurier), MMus, PhD (Northwestern)
H. Martens, ARCT (Toronto), LRSM, BA, MA (Minnesota), PhD (Columbia)
C. A. Weaver, BMus, MMus, DMus (Indiana)

Assistant Professors
K. R. Hull, ARCT (Toronto), BA (Waterloo), BMus, MMus (Western Ontario), PhD (Princeton)
D. B. Huron, BIS (Waterloo), MA (York), PhD (Nottingham)

Part-time Lecturers
W. Bartley, BA (Toronto), MA (McGill)
E. Graham, BMath, MASC (Waterloo)
C. Isaac, BMus (Wilfrid Laurier)
W. Janzen, BMus (Manitoba), MMus (Wisconsin)
M. Jarrett
T. Kroehtsch, BMus (Wilfrid Laurier), ARCT (Toronto), LTCL (London), LRSM (London)
A. Martin, ARCT, BMus (Toronto), MMus (Eastman)
S. Martin, BMus (Wilfrid Laurier), MMus (Toronto)
H. Renglich, BMus (Toronto), MMus (McGill)
R. Shantz, BMusEd (Goshen), MMusEd (South Methodist)
K. Tomlin, BA (Waterloo), BEd (Western Ontario)
M. Wood

Studio Instructors
S. Adams, Guitar
H. Bauer, Vienna State Academy, Juilliard; Violin
J. Castello, BME (Hartford), MMus (Northwestern); Trombone
C. Coleman, BM, MM (New England Conservatory, Boston); Bassoon
R. Flock, Percussion
G. Greer, BMus (Toronto); Double Bass
D. Haas, Kantor (Stuttgart); Harpsichord, Organ
A. Hamilton, DMA (Northwestern); Flute
J. Helmers, BMus (Queen's), MMus (Indiana); Cello
K. Hull, ARCT (Toronto), BA (Waterloo), BMus, MMus (Western Ontario), PhD (Princeton); Piano
M. Elligsen Hull, BSc (Waterloo); Voice
C. Lavelle, BMus (Toronto); French Horn
J. Mason, BM (Sheenraadh Conservatory), MM (Catholic University, Washington); Oboe
J. Yates, Tuba
D. Pullen, Saxophone
V. Saw, BM (McGill), MM (New England Conservatory, Boston); Clarinet
P. Thomson, University of Toronto, Juilliard; Piano
J. Tickner, Trumpet

Optometry

Professor, Associate Dean of Science for Optometry
A. P. Cullen, Dip Opt (City University-London), MSc (Saskatchewan), OD (Pennsylvania College of Optometry), PhD (City University-London), FAAO, FBCO, DCLOP

Associate Professor, Associate Director
J. G. Strong, OD, MSc (Waterloo)

Professor, Undergraduate Officer
T. D. Williams, OD (College of Optometry of Ontario), MS, PhD (Indiana), FAAO, Recipient of the Distinguished Teacher Award

Assistant Professor, Associate Undergraduate Officer
J. K. Havis, OD, MS (Ohio State), PhD (Indiana), FAAO

Associate Professor, Graduate Officer
J. G. Flanagan, BSc (Optom), PhD (Aston), MBCO, FAAO

Associate Professor, Associate Graduate Officer
M. C. Campbell, BSc (Toronto), MSc (Waterloo), PhD (ANU), FAAO, NSERC University Research Fellow

Assistant Professor, Admissions Officer
M. M. Spafford, OD, MSc (Waterloo), Recipient of the Distinguished Teacher Award

Clinical Supervisor, Clinic Director
R. Pace, OD (Waterloo), FAAO

Clinical Supervisor, Assistant Clinic Director
H. Hadley, OD (Waterloo)
University Faculty
Optometry
Peace and Conflict Studies

Professors Emeritus
E.J. Fisher, BA, MA (Toronto), DSc (Pennsylvania College of Optometry), FAAO (Retired)
W.J. Lyle, OD (College of Optometry of Ontario), MS, PhD (Indiana), FAAO, (Retired)*

Imperial Optical Visiting Professor
J.P.G. Bergman, BSc (Optom), PhD (City University, London), OD (Pennsylvania College of Optometry), FBCO, FAAO, DipCCL(AAO)

Professors
W.K. Adrian,1 Dipl-Ing, Dr-Ing (TH Darmstadt), Dr habil, apl Professor (Karlsruhe)
J.V. Lovaski, BSc (McGill), OD, MSc, PhD (Waterloo), FAAO, (on leave)
A. Remole, BFA (Manitoba), OD (College of Optometry of Ontario), MS, PhD (Indiana), FAAO
J.G. Sivak,1 LScO (Montreal), MS (Indiana), PhD (Cornell), OD (Pennsylvania College of Optometry), FAAO
G.C. Woo, OD (College of Optometry of Ontario), MS, PhD (Indiana), LOSc (Melbourne), FVCO, FAAO, DiplLV

Associate Professors
R. D. Beauchamp, BA (McMaster), MA, PhD (Brown)
M.G.E. Callender, BSc (Sir George Williams), OD (College of Optometry of Ontario), MSc (Waterloo), MPhil (Aston), FAAO
M.J. Dougherty, BSc (London), MSc, PhD (Warwick), FAAO
D.A. Ranney,2 BA, MD (Toronto), FRCS (England)
R.D. Seim,3 BA (Queen's), PhD (Waterloo)

Assistant Professors
W.R. Bobier, BSc (Queen's), OD, MSc (Waterloo), PhD (Cambridge), FAAO, MBCO
B.R. Chou, BSc (Toronto), OD, MSc (Waterloo), FAAO
D. Fonn, Dip Optom (S.A.), M Optom (NSW), FAAO
K.M. Robertson, OD, MSc, PhD (Waterloo), FAAO

Lecturer
B.E. Robinson, OD (Waterloo), MPH (Washington), FAAO

Clinical Faculty
D.B. Buck, OD (College of Optometry of Ontario), FAAO
K. Dumbleton, BSc (Optom), (UWIST, Cardiff), MSc (Waterloo), MBCO
P.K. Hrynchak, OD (Waterloo), FAAO
A.D. Plotkin, BS (Adelphi), BS, OD (Pennsylvania College of Optometry)
L. Sorbara, OD (Waterloo), FAAO
R. Wiggins, BS, OD (Indiana), FAAO

Adjunct Faculty
L. Baker, OD (College of Optometry of Ontario), FAAO
E.L. Buchner, OD (College of Optometry of Ontario), FAAO
R.G.R. Lawrence, O.C.
T. Liu, BSc Med (Hons), MB, BS (Sydney), FRACP, FRCP (C)
H.J. McMane, BBA (Willard Laurier), CA
B. Schumacher, MD (Toronto)
B. Sivak, BPT (McGill), OD, PhD (Waterloo)

P.B. Waind, BSc (Toronto), MD (McMaster), FRCSC
M.E. Woodruff, OD (College of Optometry of Ontario), PhD (Indiana), FAAO (Retired)
S. Zigan, BA (Cornell), MS, PhD (Rutgers)

Faculty Members of Optometry holding cross appointments to:
1 Systems Design Engineering
2 Physics
3 Gerontology
4 Biology

Faculty Members holding cross appointments to Optometry from:
5 Kinesiology
6 Psychology

*Also has Adjunct appointment

Clinical Faculty — Part-time (1991-92)
W.B. Andrews, BA, OD (Waterloo), FAAO
W.R. Andrews, OD (College of Optometry of Ontario)
J. Bender, OD (Waterloo)
A. Bernardi, BSc, OD (Waterloo)
D.R. Buck, OD (Waterloo)
R.R. Bock, OD (College of Optometry of Ontario)
R. Chen, OD (College of Optometry of Ontario)
P. Devenny, BSc, OD (Waterloo)
J.L. Dippel, OD (Waterloo)
G. Gies, OD (Waterloo)
D.R. Goemans, OD (Waterloo)
P. Goemans, BSc (Hons), OD (Waterloo)
G.A. Grant, OD (College of Optometry of Ontario), FAAO
H. Kader, BSc, MSc (McGill), OD (Waterloo)
A. Karidas, BSc, OD (Waterloo)
L. Lazarus, BSc (Guelph), OD (Waterloo)
C. Machan, OD (Waterloo)
C. Mathiy, OD (Waterloo)
J. McGugan, OD (Waterloo)
J. Newman, OD (Waterloo)
M. Pollock, OD (Waterloo)

S. Salsberg, OD (Waterloo)
B. Sugler, BSc, OU (Waterloo)
R.J. Scheid, OD (Waterloo)
K. Smith, OD (Waterloo)
S. Tait, OD (Waterloo)
R.J. Tartakani, OD (Waterloo), FAAO
R. Teppe, OD (Waterloo)
V. Timpano, OD (Waterloo)
D. Williams-Lyn, BSc (Optom), MSc (UWIST, Cardiff, PhD (Aston), FAAO
R.L. Wilson, OD (Waterloo)
G. Young, OD (College of Optometry of Ontario)

Peace and Conflict Studies

Associate Professor, PACS Faculty Group Chair
C.G. Brunk, BA (Wheaton), MA, PhD (Northwestern), G

Assistant Professor, Director of the Program
R.J.R. Mathies, BA (Waterloo), MSc (Guelph), EdD (Toronto), G

Assistant Professor, Undergraduate Officer
T.R. Yoder Neufeld, BA (Manitoba), MDiv, ThD (Harvard), G

Members of the Peace and Conflict Studies Faculty Group Professors
J.G. Holmes, BA, MA (Carleton), PhD (North Carolina)
K. Westhues, BA (Conception), MA, PhD (Vanderbilt)

Associate Professors
D.A. Davies, BA, PhD (Washington), Recipient of the Distinguished Teacher Award
B. Hyma, BSc, MSc (Madras), MA (Shefield), PhD (Pittsburgh)
M. Malone, BA (University College, Dublin, Ireland), BEd (Victoria University of Manchester School of Education), MA, PhD (Toronto), J
W.B. Moul, BA, MA, PhD (British Columbia)
R.J. Sawatsky, BA (Bethel), MA (Minnesota), MA, PhD (Princeton), G
M. Smyth, BA (Toronto), MA, PhD (York), R
C.A. Snyder, BA (Waterloo), MA, PhD (McMaster), G
H. Froese Tiessen, BA (Winnipeg), MA, PhD (Alberta), G
Personnel Studies  
(formerly Personnel and Administrative Studies)  

**Assistant Professors**  
- M.F. Wiebe, BA (Waterloo), MA, PhD (Saskatchewan)  
- G.O. Michaljenko, BA, PhD (Saskatchewan)  

**Institute of Peace and Conflict Studies**  
Director  
- R.J. Mathies, BA (Waterloo), MSc (Guelph), EdD (Toronto), G  

**Research Associates**  
- E.E. Regehr, BA (Waterloo), Funded by Project Ploughshares, G  
- M.F. Wiebe, BA (Winnipeg)  

**Associate Professors**  
- J.R. Home, BA, MA (Western Ontario), PhD (Waterloo), MSc (McMaster)  
- L.G. Friesen, BA (Winnipeg), MA, PhD (Saskatchewan)  
- J.P. Evans, BA (Marquette), MA, PhD (Yale)  
- J.A. Michalenko, BA, PhD (Waterloo), MA, PhD (Saskatchewan)  
- M.D. Bryant, BA, MA (Toronto), MDiv (Winedo), PhD (Toronto), (Retired)  
- M. Shimpo, J.D. (International Christian, Japan), MA, PhD (British Columbia)  

**Assoc Professors**  
- F.C. Gobeil, MA (Carleton), PhD (Concordia College), MA, PhD (Yale)  
- D.M. Amoroso, BA, MA (Toronto), PhD (Waterloo)  
- M.D. Bryant, BA (Concordia College), STB (Harvard), MA, PhD (St. Michael's)  
- A.L. Evans, BA (Toronto), MDiv (Emmanuel), STM, DMin (Andover-Newton), NCC  
- F.C. Gerard, MA (College St. Dominique, France), BD, STM (McGill), PhD (Hartford Seminary Foundation)  
- W. Klassen, BA (Goshen College), BD (Goshen Seminary), PhD (Princeton Theological Seminary)  
- R.D. Legge, BA (Transylvania), STB (Harvard), PhD (McMaster)  

**Participating Faculty**  
- A.L. Evans, BA (Toronto), MDiv (Emmanuel), STM, DMin (Andover-Newton), NCC  
- F.C. Gerard, MA (College St. Dominique, France), BD, STM (McGill), PhD (Hartford Seminary Foundation)  
- W. Klassen, BA (Goshen College), BD (Goshen Seminary), PhD (Princeton Theological Seminary)  
- R.D. Legge, BA (Transylvania), STB (Harvard), PhD (McMaster)  

**University Faculty**  
Personality and Religion, Studies in (SIPAR) —  
**Physics**  

**Associate Professors**  
- B.P. Hendley, BA (Marquette), MA, PhD (Yale)  
- E.S. Lucy, BA (Hobart)  
- A.C. Minas, PhD (Harvard)  
- W.R. Abbott, BA (Kenyon), PhD (Ohio State)  
- R.H. Holmes, BA, MA (Montana), PhD (Washington)  
- E.J. Ashworth, BA, MA (Cambridge), PhD (Bryn Mawr)  
- F.F. Centore, BSc (Canisius), MA (Maryland), PhD (St. John's), J  
- R.A. George, MA, PhD (Michigan State)  
- L.L. Heworth, BA (Rutgers), MA, PhD (Illinois)  
- J.R. Horne, BA, MA (Western Ontario), BTh (Huron), PhD (Columbia)  
- J.F. Narveson, BA (Chicago), MA, PhD (Harvard)  
- D.D. Roberts, BA (Roosevelt), MA, PhD (Illinois)  
- B.H. Suits, BA, MA (Chicago), PhD (Illinois)  
- A.G. Brunk, BA (Wheaton), MA, PhD (Northwestern), G  
- G.T. Campbell, BA (Western Ontario), PhD, PhD (Laval), J, Recipient of the Distinguished Teacher Award  
- D.T. DeMarco, BS (Stonehill, Mass.), MA, PhD (St. John's), J  
- A. Kerr-Iaweon, BA (Toronto), MA (Chicago), PhD (McMaster)  
- M.F. McDonald, BA (Toronto), MA, PhD (Pittsburgh), (on leave)  
- A.C. Minas, BA, MA, PhD (Harvard)  

**Assistant Professors**  
- J.W. Van Evra, BA (Valparaiso), MA, PhD (Michigan State)  
- M.F. Campbell, PhD (Waterloo)  
- J.A. Novak, BA (DePaul), PhD (Notre Dame)  
- R.A. Nutbrown, BA (Bishop's), MA, PhD (Carleton)  
- J. Wubnis, BA (Swarthmore), MA, PhD (Yale)  

**Faculty members holding joint appointments to Philosophy from:**  
1. Pure Mathematics  
2. Political Science  
3. Philosophy  

**G refers to faculty members at Conrad Grebel College**  
**J refers to faculty members at St. Jerome's College**  

**Philosophy**  

**Professor, Department Chair**  
- B.H. Torrie, BASc (Toronto), PhD (McMaster)  

**Associate Professor, Associate Chair of the Department**  
- D. Hemming, BSc, PhD (Bristol)  

**Associate Professors, Undergraduate Officers**  
- H.K. Ellenton, BSc (Western Ontario), MA (Toronto)  
- K.A. Woolnor, BSc (London)  

**Professor, Graduate Officer**  
- W.B. Pearson, DFC, MA, DSc (Oxford), DSc (Waterloo), FRSC, FCIC*  

**Professor Emeritus**  
- W.B. Pearson, DFC, MA, DSc (Oxford), DSc (Waterloo), FRSC, FCIC*  

**Professors**  
- A. Anderson, MA, DPhil (Oxford), Recipient of the Distinguished Teacher Award  
- R.A. Aziz, BA, MA, PhD (Toronto)  
- G.A. Bakos, MA (Bratislava), MA, PhD (Toronto), (Retired)*  
- P. Bernath, BSc (Waterloo), PhD (Massachusetts Institute of Technology)  
- F.W. Boswell, BA, MA, PhD (Toronto)  
- D.E. Brodie, BSc, MSc, PhD (McMaster)  

**Physics**  

**Professor, Department Chair**  
- I.R. Dagg, BSc (Manitoba), MS (Pennsylvania State), PhD (Toronto)  

**Associate Professor, Associate Chair of the Department**  
- D. Hemming, BSc, PhD (Bristol)  

**Associate Professors, Undergraduate Officers**  
- H.K. Ellenton, BSc (Western Ontario), MA (Toronto)  
- K.A. Woolnor, BSc (London)  

**Professor, Graduate Officer**  
- W.B. Pearson, DFC, MA, DSc (Oxford), DSc (Waterloo), FRSC, FCIC*  

**Professors**  
- A. Anderson, MA, DPhil (Oxford), Recipient of the Distinguished Teacher Award  
- R.A. Aziz, BA, MA, PhD (Toronto)  
- G.A. Bakos, MA (Bratislava), MA, PhD (Toronto), (Retired)*  
- P. Bernath, BSc (Waterloo), PhD (Massachusetts Institute of Technology)  
- F.W. Boswell, BA, MA, PhD (Toronto)  
- D.E. Brodie, BSc, MSc, PhD (McMaster)
University Faculty

Physics
Planning, Urban and Regional

J.A. Cowan, BSc (Manitoba), MA, PhD (Toronto), (Retired)*
S.G. Davison, 4 PhD, DSc (Manchester)
W.W. Duley, BSc (McGill), DIC, PhD (Imperial College), DSc (University of London)
M.P. FitzGerald, BSc, MSc (Toronto), PhD (Case)
F.O. Goodman, 4 BSc, PhD, DSc (London), FinstP, FAIP
J. Grindlay, BSc (Glasgow), DPhil (Oxford)
N.R. Isernor, 2 BSc (Acadia), MSc, PhD (McMaster)
J. Kruuv, BSc (Waterloo), PhD (Western Ontario)
J.W. Leech, BSc, PhD (London), FinstP, FAIP
J.R. Lapock, 4 BS, MS (West Virginia), PhD (Pennsylvania State)
J.D. Leslie, BSc, BSc (Toronto), MS, PhD (Illinois)
S.P. Lipsitch, 4 BSc (Natal), MSc (South Africa), PhD (Witwatersrand)
R.A. Moore, BSc, MSc (McMaster), PhD (Alberta)
A.D.S. Nagi, BA, BSc, MSc (Punjab), PhD (Delhi)
J.L. Ord, BASc (Toronto), MS, PhD (Illinois)
R.K. Pathria, BSc, MSc, Panjab, PhD (Delhi)
M.M. Pintar, BSc, MSc, PhD (Ljubljana)
J.J. Sloan, 4 BSc, PhD (Queen's)
H.J.T. Smith, BSc, PhD (London)
J. Vanderkoc, BEng, PhD (McMaster)
S.F. Wang, DSc (Nagoya), (Retired)*
P.S. Wessom, BSc (London), PhD (Cambridge), FRAS

Associate Professors
J.K. Brandon, BSc, PhD (McMaster), MA (Cambridge)
J.M. Corbett, BASc (Toronto), MSc, PhD (Waterloo)
A.E. Dixon, BSc (Mt. Allison), MSc (Dalhousie), PhD (McMaster)
P.C. Eastman, BSc, MSc, PhD (McMaster), PhD (British Columbia)
J.P. Greenhouse, 4 BSc, MSc (British Columbia), PhD (California), Recipient of the Distinguished Teacher Award
G.L. Harris, BA (Mount Holyoke College), MA (Wesleyan), PhD (Toronto)
J.W. Hepburn, 5 BSc (Waterloo), PhD (Toronto)
C.C. Lim, BA (DePauw), MA (Nebraska), PhD (Toronto), (Retired)*
W.K. Liu, 4 BSc, MS, PhD (Illinois), NSERC University Research Fellow
R.B. Mann, 4 BSc (McMaster), MSc, PhD (Toronto), NSERC University Research Fellow
H.M. Morrison, BSc, PhD (Edinburgh)

H. Peemoller, BSc (Winnipeg), MSc (Victoria), PhD (Waterloo), NSERC University Research Fellow

Assistant Professors
M.C. Campbell, 7 BSc (Toronto), MSc (Waterloo), PhD (Australian National University), FAAO
M. Fich, BSc (Waterloo), MSc, PhD (California, Berkeley)
M.F. Golnaraghili, 8 BSc, MSc (Worcester), PhD (Cornell)
K.T. Leung, 9 BSc, PhD (British Columbia)
L.F. Nazar, 4 BSc (British Columbia), PhD (Toronto)
D.C. Nobes, 8 BSc, MSc, PhD (Toronto)
G. Scholz, BSc (Simon Fraser), MSc (McMaster), PhD (Simon Fraser)

Adjunct Faculty
R.B. Barnett, BSc (McGill), MSc (Alberta), PhD (Toronto)
J.A. Blackburn, BSc (McMaster), MSc, PhD (Waterloo)
P.A. Egelstaff, BSc, PhD (London), FRSC
W.E. Harris, BSc (Alberta), MSc, PhD (Toronto)
T.E. Gough, BSc, PhD (Leicester)
H.H. Jong, BSc (Waterloo), MSc, PhD (Queens)
J. Lit, BSc, DipEd (Hong Kong), DSc (Laval)
H.B. Michaelis, BSc, MSc, PhD (Toronto)
A. Rudin, BSc (Alberta), PhD (North-western)
G. Scoles, Dottors in Chimica (Genova), LibDoc, FCIC

Senior Demonstrators
A.B. Haner, BSc, MSc (Waterloo)
D.S. McVicar, BSc (Waterloo)

Demonsrators
J.L. Gardiner, BSc (Waterloo)
J.R. Jayasundara, BSc (Waterloo)

Faculty Members of Physics holding cross appointments to:

1) Biology
2) Chemistry
3) Applied Mathematics
4) Applied Mathematics
5) Chemistry
6) Earth Sciences
7) Optometry
8) Mechanical Engineering

Faculty Members holding cross appointments to Physics from:

4) Applied Mathematics
5) Chemistry
6) Earth Sciences
8) Chemistry

Faculty Members holding joint appointments with:
5) Earth Sciences
8) Chemistry

*Also has Adjunct appointment

Planning, Urban and Regional

Professor, Director, The School of Urban and Regional Planning
L.R.G. Martin, BA (Queen's), MA, MRPh, PhD (Syracuse), MOAA

Associate Professor, Associate Director
J.T. Horton, BA (Wheaton), MA (Northwestern)

Associate Professor, Undergraduate Officer
S. Herzog, BArch (Toronto), MOAA

Associate Professor, Graduate Officer
R.C. Suffling, BSc Honors (Wales), PhD (Guelph)

Professors
H.S. Coblenz, BA Hons (Durham), MRPh (North Carolina), AICP, FSS
L.O. Gertler, BA (Queen's), MA (Toronto), FCIP, (Retired)*
D.W. Hoffman, BSc, MSc (Toronto), PhD (Waterloo), (Retired)*
C.K. Knapper, 3 BA Hons (Sheffield), PhD (Saskatchewan)
G.G. Mulamoottil, 4 BSc (Mysore), MSc (Bombay), PhD (Delhi)
J.G. Nelson, 4 BA (McMaster), MA (Colorado), PhD (Johns Hopkins)
N.E.P. Pressman, BArch (McGill), MAR, urb des (Cornell), Cert USP (Manchester), MCIP, AICP, AIU
J.B. Theberge, 4 BScA (Guelph), MSc (Toronto), PhD (British Columbia)

Associate Professors
P. Fillon, BA, MA (Laval), PhD (Kent)
G.H. Hall, 1, 2 BA Hons (Otago, New Zealand), MA, PhD (McMaster)
B. Hyma, 2 BSc, MSc (Madras), MA (Sheffield), PhD (Pittsburgh)
B. Moore Milroy, BA (McGill), M.urb. (Montreal), PhD (British Columbia)
R.T. Newkirk, 3 BA, MSc, PhD (Western Ontario)
W.I. Shalinsky, BA, BSW (McGill), MSc, DSW (Western Reserve)

Assistant Professors
M.E. Haight, BSc, MSc, PhD (McMaster)
N.M. Lazarowich, BA (Saskatchewan), MA, MCP, PhD (Cincinnati)
M.E. Tyler, BSc (Brandon), MDes, PhD (Calgary)
Lecturer
K. Bowles Hammond, BLA (Guelph), MA (Waterloo)

Adjunct Faculty
G. Davidson, BA (Toronto), MA (Waterloo), PhD (Western Ontario), MCIP, OPPi
M. Dorfman, BComm (Montreal), MSc (Toronto), MCIP, OPPi
S. Garrod, BA (McMaster), LLB, MES (York)
W. Green, BES (Waterloo), MCIP, OPPi

Faculty Members of Planning holding cross and/or joint appointments to:
1Geography
2Environmental Studies

Faculty Members holding cross and/or joint appointments to Planning from:
3Environmental Studies
4Geography
5Faculty Member holding joint appointment with Environmental Studies
6Also has Adjunct appointment

Polish

For faculty listing consult Germanic and Slavic Languages and Literatures.
University Faculty
Psychology
Pure Mathematics

K. Bloom, BSc (Loyola), MA, PhD (North Carolina)

P.E. Bowers, BA (Queen’s), MA, PhD (Illinois)

A.J.R. Cameron, BA, MA, PhD (Waterloo)

N. Charness, BA (McGill), MS, PhD (Carnegie-Mellon)

J.M. Cornell, BA, MS, PhD (Washington), (part-time)

W.B. Cowan, BSc (Waterloo), PhD (McGill)

G.A. Griffin, BA (Colgate), MA, PhD (Wisconsin), Recipient of the Distinguished Teacher Award

S. Hymel, BSc, MA, PhD (Illinois)

P. Jolicouer, BSc (McGill), PhD (Harvard)

R.H. Lallue, BSc (Fordham), PhD (Waterloo), R

G.E. MacKinnon, BA (Queen’s), PhD (John Hopkins)

J. Michela, BS (Maryland), MA, PhD (California, Los Angeles)

P.J. Naus, BA, PhD (Nijmegen), J

J.E. Orlando, BA (Western Ontario), MA, PhD (Michigan), J

E.A. Roy, BSc (Waterloo), MPE (British Columbia), PhD (Waterloo)

R. Schlegel, BA (Western Ontario), MSc (Illinois), PhD (Ohio State)

R.D. Baun, BA (Queen’s), PhD (Waterloo)

J. Theis, BA (Western Ontario), MA (Notre Dame), PhD (Windsor), J

J.A. Van Evra, BA (Valparaiso), MA (Bowling Green), PhD (Michigan State), J

P.E. Wainwright, BSc (Rhodes), MA, PhD (Waterloo)

E.E. Ware, BA, MA (Richmond), PhD (Illinois)

J. Wood, BA (Wisconsin), MA, PhD (California, Los Angeles)

E.Z. Woody, BA (Reed), MS (Oxford), PhD (Duke)

Assistant Professors

G.T. Fong, AB (Stanford), PhD (Michigan)

D.W. Griffin, BA (British Columbia), AM, PhD (Stanford)

J.K. RempeI, BA, MA, PhD (Waterloo), J

Adjoint Faculty

J.R. Amour, BS (Portland State), MA, PhD (Denver)

D. Baar, BA (Hope College, Holland Michigan), PhD (Waterloo)

T.E. Cadell, BA (British Columbia), MA (Massachusetts), PhD (Wisconsin), (Retired)

R.J. Dart, BS (Washington), MA, PhD (Waterloo)

B.S. Francis, BS (Ursinus), MA, PhD (Arizona)

J.J. Hartford, MO (Toronto)

C.B. Lowry, BA (McGill), MA, PhD (Michigan State)

R.E. Mann, BA, MAsc, PhD (Waterloo)

L. Rose-Krasnor, BA (Boston), MAsc, PhD (Waterloo)

L. Swanson, BA, PhD (Waterloo)

J.L. Williams, BA, MA (Alberta), PhD (Missouri)

Faculty Members of Psychology holding cross appointments to:

1 Optometry
2 Kinesiology
3 Health Studies
4 Systems Design Engineering

Faculty Members holding cross appointments to Psychology from:

5 Environmental Studies
6 Kinesiology
7 Statistics
8 Health Studies
9 Computer Science

J refers to faculty members at St. Jerome's College

R refers to faculty members at Renison College

Pure Mathematics

Associate Professor, Department Chair: F. Zorrito, BSc (Windsor), MSc, PhD (Queen’s)

Professor, Associate Chair for Graduate Affairs: J.A. Baker, BA, MA (Saskatchewan), PhD (Waterloo)

Associate Professor, Associate Chair for Undergraduate Affairs: L.J. Dickey, BA, MA (Arizona), PhD (Wisconsin)

Distinguished Professor: J. Azcón, BA, MA, PhD (Budapest), Habil DSc (Hungarian Academy of Sciences), FRSC

Professors

S. Burris, BSc, MA, PhD (Oklahoma)

G.E. Cross, BA, MA (Dalhousie), PhD (British Columbia)

L.J. Cummins, BSc (Roosevelt), MSc (de Paul), PhD (British Columbia)

K.R. Davidson, BMath (Waterloo), PhD (California, Berkeley), Steacie Fellow

D.Z. Djokovic, BSc, PhD (Belgrad)

D.A. Higgs, BSc Hons (Witwatersrand), MA (Cambridge), PhD (McMaster)

P. Hoffman, BA (Toronto), PhD (Manchester)

J. Kannappan, BSc Hons (Annamalai), PhD (Washington)

J.W. Lawrence, BSc Hons (Carleton), MSc (McGill), PhD (Carleton)

C.T. Ng, BSc (Chinese University of Hong Kong), MMath, PhD (Waterloo)

W.F. Shadwick, MSc (Western Ontario), PhD (London), NSERC University Research Fellow

C.L. Stewart, BSc (British Columbia), MSc (McGill), PhD (Cambridge), FRSC, Killam Fellow

F.C.Y. Tang, BSc (Hong Kong), MS (South Carolina), PhD (Illinois)

Associate Professors

W.J. Gilbert, BA, MA (Cambridge), DPhil (Oxford)

A. Kerr-Lawson, BA (Toronto), MA (Chicago), PhD (McMaster)

E.M. Moskal, BA (Toronto), PhD (Illinois)

Assistant Professors

B. Forrest, BSc, MSc, PhD (Alberta)

K. Hare, BMath (Waterloo), PhD (British Columbia)

K.A. Rowe, BSc (Toronto), MS (Wisconsin), PhD (Illinois)

Adjunct Faculty

H. Haruki, MSc, PhD (Osaka)

R.A. Staal, BA, MA, PhD (Toronto)

Faculty Members holding cross appointments to:

1 Pure Mathematics/Appplied Mathematics
2 Pure Mathematics/Philosophy
3 Pure Mathematics/Combinatorics and Optimization
4 Pure Mathematics/Computer Science
Recreation and Leisure Studies

Professor, Department Chair
R.C. Mannell, BA (McMaster), MPE, PhD (Windsor)

Lecturer, Associate Chair, Undergraduate Affairs
A. Gilbert, BA, MA (Waterloo)

Assistant Professor, Associate Chair, Graduate Affairs
B. Smale, BA, MA (Waterloo), PhD (Western Ontario)

Professors
E.M. Avedon, BSS (William and Mary), MA, FoD (Columbia)
W.R. Forbes, BSc, PhD, DSc (London), DIC, ARCS
S.L.J. Smith, BA (Wight State), MA (Ohio State), PhD (Texas A&M)
G. Wall, BA (Leeds), MA (Toronto), PhD (Hull)
J. Zuzanek, MA (Moscow State University), CSc (Prague Institute of Sociology), PhD (Charles University, Prague)

Associate Professors
P. Eagles, BSc (Waterloo), MSc (Guelph), PhD (Waterloo), MCIP
D. Getz, BES (Waterloo), MA (Carleton), PhD (Edinburgh)
R. Johnson, BA, MA (Windsor), PhD (Minnesota)

Assistant Professors
R.D. Graham, BA, MA (Western Ontario)
L. Heywood, BA (North Dakota), MA (Florida State), PhD (Wisconsin)
R.E. McCarville, BSc, BEd, MRec (Acadia), PhD (Texas A&M)
A.M. Pedlar, BA (Wilfrid Laurier), MA, PhD (Waterloo)

Adjunct Faculty
D. Ng, BA (Lingnan), MA (Carver), MS, ReD (Indiana)
D. Reid, MA, PhD (Waterloo)

Faculty Members of Recreation and Leisure Studies holding cross appointments to:
1 Sociology
2 Geography

Faculty Members holding cross appointments to Recreation and Leisure Studies from:
2 Geography
2 Statistics and Actuarial Sciences

Religious Studies

Associate Professor, Department Chair
M.D. Bryant, BA (Concordia College), STB (Harvard), MA, PhD (St. Michael's), R

Associate Professor and Undergraduate Officer
A.F. Thompson, BA (Toronto), BTh (Huron), MA (Western Ontario), STM, PhD (McGill)

Professor
W. Klassen, BA, BD (Goshen), PhD (Princeton)
J.W. Miller, BA (Goshen), BD (Princeton Theological Seminary), MA (New York), ThD (Basel), G

Associate Professors
M.S. Bird, BA, MA, PhD (Iowa), R
A.L. Evans, BA (Toronto), BD (Emmanuel), STM (McGill), DMin (Andover-Newton), P
F.C. Gérard, MA (Collage St. Dominique, France), BD, STM (McGill), PhD (Hartford Seminary Foundation), P
M.W. Higgins, BA (St. Francis Xavier), MA, PhD (York), J
R.D. Legge, BA (Transylvania), STB (Harvard), PhD (McMaster), P
M.T. Malone, BA (University College, Dublin), MA, PhD (Toronto), J
A.J. Reimer, BA (Manitoba), MA (Toronto), MA, PhD (St. Michael's), G
D.J. Sahas, BA (Athena), STM (Christian Theological Seminary), PhD (Hartford Seminary Foundation)
R.J. Sawatsky, BA (Bethel, Kansas), MA (Minnesota), MA, PhD (Princeton), G

Assistant Professors
T. Yoder Neufeld, RA (Manitoba), MDiv, ThD (Harvard), G

Lecturers
R. Kooistra, BTh (Kampen), DTh (Amsterdam), P
S.A. MacDonald, BA, BA (St. Jerome's College)
F.A. Scinto, BA, STB (Western Ontario), MA (St. Louis), J

Faculty Members of Religious Studies holding cross appointments to:
1 Fine Arts
2 English
3 History

G refers to Faculty members at Conrad Grabel College.

Russian

For faculty listing consult Germanic and Slavic Languages and Literatures.

Sexuality, Marriage and the Family (Studies in)

Associate Professor, Acting Director
J.P. Theis, BA (Western), MA (Notre Dame), PhD (Windsor), J

Associate Professor
P.J. Naus, BA, PhD (Nijmegen), J

Assistant Professor
J.K. Rempel, BA, MA, PhD (Waterloo), J

J refers to faculty members at St. Jerome's College
Social Development Studies

Associate Professor, Undergraduate Officer
M. Smyth, BA (Toronto), MA, PhD (York), R

Associate Professor, Co-ordinator of English Language Programs
J. Miller, BA, BLS (McGill), MA, MPhil (Waterloo), PhD (York), FRSA, R

Lecturer, Co-ordinator of Placement
D. Clark, BA, BSW (Western Ontario), MSW (Waterloo), R

Professor Emeritus
D.G.S. M'Timkulu, BA, MA (South Africa), MA (Yale), PhD (Natal), R

Professors
J.L. Campbell, 1 BA (Carleton), MSc (Econ) (London), FRSA, R
J.O. Towler, BA (Toronto), MEd, PhD (Alberta), R

Associate Professors
M.S. Bird, 2, 3 BA, MA, PhD (Iowa), R
M.D. Bryant, 3 BA (Concordia College), STB (Harvard), MA, PhD (St. Michael's), FRSA, R
R. Lahue, 3 BSc (Fordham), PhD (Waterloo), R
M.I. Nagier, 4 BA (British Columbia), MA (Chicago), PhD (Stirling), R
M. Zentner, BA (Temple), MSW (Kansas), R

Sessional Associate Professor
J.T. Harris, BMus (Temple), MSW (Pennsylvania), R

Assistant Professors
T. Brenner, BA (Waterloo), MSW (Wilfrid Laurier), R
J. Majonis, BA, MA (CUNY), MSW (SUNY, Albany), PhD (Toronto)
K. Mott, BA (Wilfrid Laurier), BD (Union Theological Seminary), MSW (SUNY, Buffalo)

Adjunct Assistant Professors
A. Abbott, BA (Waterloo), MSW (Wilfrid Laurier), R
J. Bambrick, BA, MA (Guelph), PhD (Windsor), R
B. Bell-Rowbotham, BA, MA (Western Ontario), R
L. Fusco, BA (Hofstra), MA (Chicago)

D. Payne, BA (Sir George Williams), MSW (Wilfrid Laurier), R
M. Thompson, STh (Wycliffe), RN (Wellesley), BA (Waterloo), MSW (Wilfrid Laurier), R

Lecturers
J. Boyd, BA (Guelph), MSW (Wilfrid Laurier)
S. Campbell, BA (Waterloo), MSW (Wilfrid Laurier)
P. Derry, BA. MA, PhD (Western Ontario), CPSych, R
T. Eve, BA (Guelph), BSW, MSW (Windsor)
R. Finch, BA (Waterloo), MSW (Wilfrid Laurier)
C. Gillin-Garing, BSc (Pittsburgh), MA, PhD (Windsor)
P. Gove, BA (Waterloo), MSW (Wilfrid Laurier), R
C. Hollidge, BA (Waterloo), MSW (Wilfrid Laurier), R
N. Millard, ARTC (Royal Conservatory), BA, MSW (Wilfrid Laurier)
D. Pullman, BRED (Briercrest), MDiv (Talbot), MA (Waterloo), R
J. Tucker, RN (Toronto Western), BA (Windsor), MA (Carleton)
J. Turner, BA, BSW, MSW (Toronto), R
V. Wall, BA, MSW (Toronto)
A. Wilson, BA (Clarke), MA (Iowa), MSW (Wilfrid Laurier), R
J. Zinkann, BA (Toronto), LLB (Osgoode), MWS (Wilfrid Laurier), R
L. Zinkann, BA, MSW (Wilfrid Laurier)

Faculty Members of Renison College holding cross appointments to:
1 Political Science
2 Religious Studies
3 Sociology
4 Fine Arts

R refers to faculty members at Renison College

Social Work

For faculty listing consult Social Development Studies.

Society, Technology and Values

Associate Professor, Director
G.F. Atkinson, MA, PhD (Toronto), CChem, FRSC (UK), FCIC, Chemistry

Assistant Professor, Option Co-ordinator
D.B. Huron, BIS (Waterloo), MA (York), PhD (Nottingham)

Administrative Committee
Professors
R.K. Banks, BA, MA, PhD (Toronto), Dean of Arts
J.H. Bater, BA, MA (British Columbia), PhD (London), Dean of Environmental Studies
D.J. Burns, BSc, PhD (Bristol), PEng, CEng, Dean of Engineering
J.D. Kahleisch, BSc, MMath, PhD (Waterloo), Dean of Mathematics
J.G. Kahleisch, BSc (Toronto), MA, PhD (Waterloo), Associate Provost (Ex officio)
R.G. Martieniuik, BPE, MA (Alberta), EdD (California, Berkeley), Dean of Applied Health Sciences
J.E. Thompson, BSA (Toronto), PhD (Alberta), FRSC, Dean of Science

Advisory Board
Associate Professors
N.R. Ball, BA (McMaster), MA, PhD (Toronto), Civil Engineering
J.W. Hepburn, BSc (Waterloo), PhD (Toronto), Chemistry
M.E. Jernigan, SB, SM, PhD (Massachusetts Institute of Technology), PEng, Recipient of the Distinguished Teacher Award, Systems Design Engineering
R.D. Legge, BA (Transylvania), STB (Harvard), PhD (McMaster), P, Religious Studies
S. C. Lerner, BA (Ohio State), MA (Columbia), Recipient of the Distinguished Teacher Award, Environment and Resource Studies
Sociology

Professor, Department Chair
R.D. Lambert, BA, MA (McMaster), PhD (Michigan)

Assistant Professor, Associate Chair for Undergraduate Studies
R.D. Hiscott, BA (Carleton), MA Queen’s, PhD (Toronto)

Professor, Associate Chair for Graduate Studies
J. Goyder, BA (Bishop’s), MA, PhD (McMaster)

Professor Emeritus
H.J. Failing, BA, BSc, MA (Sydney), PhD (Australian National), FRSC

Professors
J.E. Curtis,1 BA (Sir George Williams), MA (Central Michigan), MA (Cornell)
W.F. Forbes,2 BSc, PhD, DSc (London), DIC, ARCS
R.C. Prus, BA (Manitoba), MA, PhD (Iowa)
E.W. Vaz, BA, MA (McGill), PhD (Indiana), (Retired)*
K. Westhuys, BA (Conception), MA, PhD (Vanderbilt), Recipient of the Distinguished Teacher Award
A. Wipper, BA, MA (McGill), PhD (California, Berkeley)
J. Zuzanek,3 MA (Moscow State University), CSc (Prague Institute of Sociology), PhD (Charles University, Prague)

Associate Professors
P.J. Carrington, BA (Harvard), MA, PhD (Toronto)
1 F. Desroches, BA (Waterloo), MA (Toronto), PhD (Waterloo), J
F.A. Fasick, BA (Pennsylvania State), MA, PhD (Columbia)
M.I. Nagler, BA (British Columbia), MA (Chicago), PhD (Stirling, UK), R
N. Theberge,1 BA (Massachusetts), MA (Boston), PhD (Massachusetts)
G.K. Warmer, BA (British Columbia), MSc (Wisconsin), PhD (British Columbia)

Faculty Members of Sociology holding joint appointments to:
1Kinesiology
2Statistics and Actuarial Science
3Recreation and Leisure Studies

Faculty Members holding cross-joint appointments to Sociology from:
4Soviet and East European Studies

Associate Professor, Director
R. Karpiak, BA, MA (Manitoba), PhD (Alberta)

Spanish

Associate Professor, Department Chair
A. Fama, BA (Brock), MA (Western Ontario), PhD (SUNY, Buffalo)

Assistant Professor, Undergraduate Officer
M. Gutiérrez, BA, MA (McGill), PhD (Laval)

Associate Professor
C.M. Fernández, Lic en Arq (Madrid), MA (Tulane), D Lit et Phil Universitas Complutensis (Madrid)

Language Instructor
P. Graham, BA (McMaster)

Participating Adjunct Faculty at Wilfrid Laurier University

Professor
A.A. Boríás, BA (Kentucky), MA (Indiana), PhD (Pennsylvania State)

Assistant Professor
M. Ratcliffe, BA, MA (Carleton), PhD (Toronto)
Professor and Department Chair

K. S. Brown, BMath, PhD (Waterloo)

Associate Professor, Associate Chair, Statistics, Undergraduate Affairs

R. W. Olford, BMmath (Waterloo), MSc, PhD (Toronto)

Professor, Associate Chair, Actuarial Science

H. H. Panjer, BA, MA, PhD (Western Ontario), FSA, FCIA

Associate Professor, Associate Chair, Graduate Studies

D. E. Matthews, BA, MA (Western Ontario), PhD (London), DIC

Professor, GM/NSERC Industrial Research Chair in Quality and Productivity

C. F. J. Wu, BSc (Taipei, Taiwan), PhD (California)

Professors

B. Abraham, BSc (Kerala), MSc (Guelph), PhD (Wisconsin)

P. P. Boyle, BSc (Queen’s, Belfast), MSc, PhD (Trinity, Dublin), FIA (London), FCIA

W. H. Cherry, BSc, PhD (Melbourne)

V. T. Farewell, BMath, MMath, PhD (Waterloo), PhD (London), DIC (Imperial College)

W. F. Forteze, BSc, PhD, DSc (London), DIC, ARCS

V. P. Godambe, MSc (Bombay), PhD (London)

K. W. Hipel, BASc, MASc, PhD (Waterloo)

J. D. Kalbfleisch, BSc, MMath, PhD (Waterloo)

J. G. Kalbfleisch, BSc (Toronto), MA, PhD (Waterloo)

J. F. Lawless, BSc, MSc, PhD (Waterloo)

D. L. McLeish, BSc (Queen’s), MSc (Toronto), PhD (McGill)

K. R. Shath, BA, MA (Bombay), PhD (Indian Statistical Institute)

D. A. Sproul, BA, MA, PhD (Toronto), FRSC, FRPS

M. E. Thompson, BSc (Toronto), MSc, PhD (Illinois)

Associate Professors

W. H. Aitken, BA (Toronto), EA, FSA, FCIA, MAAA (American Academy of Actuaries)

G. W. Bennett, BSc, BA, PhD (Adelaide)

M. A. Bennett, BA (Nottingham), FSA, FCIA

A. U. Brender, BSc (McGill), MA, PhD (California, Berkeley), FSA, FCIA

R. L. Brown, BMath (Waterloo), FSA, FCIA, ACAS

R. J. MacKay, BSc (Waterloo), MSc, PhD (Toronto)

F. G. Reynolds, BSc, MSc (Manitoba), EA, FSA, FCIA, MAAA

W. S. Rickert, BSc, PhD (Waterloo)

J. C. Robinson, BASc, MSc, PhD (Waterloo)

K. P. Sharp, BA (Cambridge), MA (California, Berkeley), PhD (Waterloo), FCIA, FIA, FSA

C. G. Small, BSc (Regina), MSc (Alberta), PhD (Cambridge)

W. J. Welch, BSc (Loughborough, England), MS, PhD (London)

G. E. Willmot, BMath, MMath, PhD (Waterloo), FSA, FCIA

J. B. Whitney, BA, MA (Western Ontario), PhD (Toronto)

J. J. Young, BASc (Toronto), MSc (Waterloo), PhD (Edinburgh)

Assistant Professors

C. D. Cutler, BSc (Manitoba), MSc, PhD (Carleton)

R. Gentleman, BSc (British Columbia), MSc, PhD (Washington)

M. Hamada, BS, MA (Maryland), PhD (Wisconsin)

D. J. Murdoch, BMath (Waterloo), MSc, PhD (Carleton)

R. J. O’Hara Hines, BA (New Brunswick), MA (Queen’s), MMath (Waterloo)

C. A. Struthers, BMath, MMath, PhD (Waterloo), J

Lecturer

C. Springer, BSc, MSc (McGill)

Adjunct Faculty

G. B. Chaplin, BA (Cambridge), MSc, PhD (Oxford)

Sir D. R. Cox, FRS, PhD (Cambridge)

D. A. S. Fraser, BA, MA (Toronto), MA, PhD (Princeton)

C. Genest, BSc (Quebec), MSc (Montreal), PhD (British Columbia)

H. Ramulai-Hansen, MA, PhD (Copenhagen)

Faculty Members of Statistics and Actuarial Science holding cross appointments to:

1Sociology and Recreation and Leisure Studies

2Psychology

3Health Studies

Faculty Members holding cross and/or joint appointments to Statistics and Actuarial Science from:

4Health Studies

M. A. Bennett, BA (Nottingham), FSA, FCIA

A. U. Brender, BSc (McGill), MA, PhD (California, Berkeley), FSA, FCIA

R. L. Brown, BMath (Waterloo), FSA, FCIA, ACAS

R. J. MacKay, BSc (Waterloo), MSc, PhD (Toronto)

F. G. Reynolds, BSc, MSc (Manitoba), EA, FSA, FCIA, MAAA

W. S. Rickert, BSc, PhD (Waterloo)

J. C. Robinson, BASc, MSc, PhD (Waterloo)

K. P. Sharp, BA (Cambridge), MA (California, Berkeley), PhD (Waterloo), FCIA, FIA, FSA

C. G. Small, BSc (Regina), MSc (Alberta), PhD (Cambridge)

W. J. Welch, BSc (Loughborough, England), MS, PhD (London)

G. E. Willmot, BMath, MMath, PhD (Waterloo), FSA, FCIA

J. B. Whitney, BA, MA (Western Ontario), PhD (Toronto)

J. J. Young, BASc (Toronto), MSc (Waterloo), PhD (Edinburgh)

Assistant Professors

C. D. Cutler, BSc (Manitoba), MSc, PhD (Carleton)

R. Gentleman, BSc (British Columbia), MSc, PhD (Washington)

M. Hamada, BS, MA (Maryland), PhD (Wisconsin)

D. J. Murdoch, BMath (Waterloo), MSc, PhD (Carleton)

R. J. O’Hara Hines, BA (New Brunswick), MA (Queen’s), MMath (Waterloo)

C. A. Struthers, BMath, MMath, PhD (Waterloo), J

Lecturer

C. Springer, BSc, MSc (McGill)

Adjunct Faculty

G. B. Chaplin, BA (Cambridge), MSc, PhD (Oxford)

Sir D. R. Cox, FRS, PhD (Cambridge)

D. A. S. Fraser, BA, MA (Toronto), MA, PhD (Princeton)

C. Genest, BSc (Quebec), MSc (Montreal), PhD (British Columbia)

H. Ramulai-Hansen, MA, PhD (Copenhagen)

Faculty Members of Statistics and Actuarial Science holding cross appointments to:

1Sociology and Recreation and Leisure Studies

2Psychology

3Health Studies

Faculty Members holding cross and/or joint appointments to Statistics and Actuarial Science from:

4Health Studies

5Systems Design Engineering

6Accounting

J refers to faculty members whose primary association is with St. Jerome’s College

Systems Design Engineering

Professor, Department Chair

M. Chandrashekhar, BTech (Indian Institute of Technology, Kanpur), MSc, PhD (Waterloo), PEng

Professor, President of the University

D. T. Wright, BASc (Toronto), MS (Illinois), PhD (Cambridge), PEng (Carleton), LLD (Memorial), LLD (Concordia), LHD (Northern Ontario), DU (Strathclyde), FCAE, PEng, APEO Gold Medal

Professor, Associate Chair, Undergraduate Studies

P. H. O. N. Roe, BASc (Toronto), MSc, PhD (Waterloo), PEng

Associate Professor, Associate Chair, Graduate Studies

G. J. Savage, BASc, MAsc, PhD (Waterloo), PEng

Professors

T. K. Adrian, Dipl-Ing, Dr-ing (TH Darmstadt), Dr habil, (Karsruhe)

M. P. Bryden, SB (Massachusetts Institute of Technology), MSc, PhD (McGill)

A. P. Cullen, Dipl Opt (City University-London), MSc, Saskatchewan, OD (Pennsylvania College of Optometry), PhD (City University-London), FAAO, FBCO, DCLP

K. W. Hipel, BASc, MASc, PhD (Waterloo), PEng

K. Huseyin, MSc (Istanbul), PhD (London), DSc (Eng)(London), PEng, Recipient of the Distinguished Teacher Award

M. E. Jemigan, SB, SM, PhD (Massachusetts Institute of Technology), PEng, Recipient of the Distinguished Teacher Award

H. K. Kesavan, BSc, BE (Mysore), MS (Illinois), PhD (Michigan State), PEng

G. N. Soulis, BASc (Toronto), PEng

T. E. Unny, BE (Madras), MTech (Kharagpur), Dr ing (Droxford), PEng

D. A. Winter, BSc, MSc (Queen’s), PhD (Dalhousie), PEng
University Faculty
Ukrainian
Women's Studies

A.K.C. Wong, BSc, MSc (Hong Kong), PhD (Carnegie), PEng

Associate Professors
P.H. Calamai, BASc, MASc, PhD (Waterloo)
M.L. Constant, BSc (Toronto), (Retired)*
C.K.G. Hahn, MASc (Waterloo)
M. Kamel, BSc (Alexandria), MSc (McMaster), PhD (Toronto), PEng
G.F. Rabideau, BA, MA (Wisconsin), PhD (Purdue), (Retired)*
B.L. Wills, BASc, MASc, PhD (Waterloo), PEng

Assistant Professors
G.L. Greig, BSc (Queen's), MASc (Western Ontario), PhD (Toronto)
G.R. Heppler, BASc, MASc, PhD (Toronto), PEng
J.J. Kay, BASc (McGill), MASc, PhD (Waterloo)
K. Ponnambalam, BE (Madras), MSc (National University of Ireland), PhD (Toronto)
J.A. Robinson, BSc (Durham), MSc, PhD (Essex)
H.C. Shen, BMath (Waterloo), MSc (Toronto), PhD (Waterloo)
D.W. Stashuk, BASc (Waterloo), MEng, PhD (McMaster), PEng

Adjunct Faculty
M. De, BSc (Madras), MSc (Indian Institute of Technology, Madras), AICB (York), MASc, PhD (Waterloo)
J.N. Kapur, BA, MA, PhD (Math) (Delhi)
D.M. Kilgour, BASc, MSc, PhD (Toronto)
G.P. Madhavan, BSc, (Calicut), MS (Indian Institute of Technology, Madras), AICB (York), MASc, PhD (Waterloo)
A.I. McLeod, BMath, MMath, PhD (Waterloo)
N. Okada, BASc, MASc, DEng (Kyoto)
E. Siddall, BSc (Eng) (London) PEng
K. Singhal, BTech (Indian Institute of Technology, Kharagpur), MS, EngScD (Columbia), PEng
D.A. Stacey, BSc (Guelph), MASc, PhD (Waterloo)

Faculty Members holding cross appointments to Systems Design Engineering from:

1 Optometry
2 Psychology
3 Management Sciences
4 Kinesiology
5 Environment and Resource Studies

*Also has Adjunct appointment

Ukrainian

For faculty listing consult Germanic and Slavic Languages and Literatures.

Women's Studies

Acting Director
M.G. Davies, BA (Washington), AM (Harvard)

Members of the Women's Studies Board

University of Waterloo
Professors
P.Y. Forsyth, AB (Mount Holyoke), MA, PhD (Toronto), Recipient of the Distinguished Teacher Award

Associate Professors
G.A. Griffin, BA (Colgate), MA, PhD (Wisconsin), Recipient of the Distinguished Teacher Award, Advisor to the Vice-President, Academic & Provost, on Interdisciplinary Programs
B. Hyma, BS, MS (Madras), MA (Sheffield), PhD (Pittsburgh)
W.L. Mitchinson, BA, MA, PhD (York)
P.J. Naus, PhD (Nijmegen, The Netherlands)
C.A. Struthers, BMath, MMath, PhD (Waterloo)

Assistant Professors
B.G. Hanson, BA (Western Ontario), MA (Carleton), PhD (Toronto)
K.M. Kovači, BSc (York), MSc (Lakehead), PhD (Guelph)
G.O. Michalenko, BA, PhD (Saskatchewan)

Library
S.E. Bellingham, BA (Waterloo Lutheran), MLS (Western Ontario)
The University Chancellor (left) confers a PhD degree on UW's youngest doctoral graduate (centre) at the October, 1990 convocation. UW's Registrar (right) assists.
The Board of Governors

The Board of Governors acts as the governing body of the University and as such has the power to control UW's property and revenues, and the conduct of its business and affairs. Planning and implementation of the physical and operational development of the University, establishment and enforcement of rules and regulations with respect to University property, and designation of University funds are included under the jurisdiction of the Board of Governors.

The membership of the Board of Governors consists of representatives from the University faculty, staff and student bodies, and the community-at-large, as well as appointees from the Lieutenant-Governor-in-Council, and a number of ex officio members.

Officers
Chairman, J.T. Eyton
Vice-Chairman, M.F. Garvey
Secretary, L.H.P. Claxton

Ex Officio
Chancellor, S. Ostry (effective May 1, 1991)
Chancellor, J.P.R. Wadsworth (term to April 30, 1991)
President, D.T. Wright
Mayor of the City of Waterloo, W.B. Turnbull
Mayor of the City of Kitchener, D.V.P. Cardillo
Regional Chairman, K. Sailing

From the Community-at-Large
E. Agnew, Toronto
J. Bergsma, Chatham
K. Copeland, Toronto
J.T. Eyton, Toronto
M.F. Garvey, Toronto
P. Koch, Ottawa
J.D. MacDonald, Toronto
D. McMullen, Toronto
P.D. Mitchell, Waterloo
M.C. Volker, Waterloo

Appointed by the Lieutenant-Governor-in-Council
F.C. Ansley, Toronto
S.C. Bassett-Klauber, Toronto
C.S. Boyce, London
D.H. Haberstroh, Ayr
P.A. McLagan, Toronto
A. Sarlos, Toronto
P.H. Sims, Kitchener

Staff
K. Dietrich (Plant Operations)
H. Hahn (Dean of Science Office)

Governing Bodies
Board of Governors
Senate

From Senate
Faculty Members
G.C. Andrews
G.F. Atkinson
D.A. Brisbin
J.A. Brox
P.Y. Forsyth
V.F. Golini
W.R. Needham

Undergraduate Students
D. Cunningham
O.G. Da Silva
T. Siwinsk

Graduate Students
N.K. Joannette
A. Steinhauer

Senate

Senate establishes educational policies of the University including admission standards, policies concerning the qualifications of faculty members, curricula of all courses of instruction, and co-ordination of long-range academic planning.

In order to exercise these powers effectively, a number of Councils and Committees have been created which report to Senate directly. These include Senate Undergraduate Council, Senate Scholarships and Student Aid Committee and Senate Long Range Planning Committee.

Officers
Chairman, D.T. Wright, BASc, MS, PhD, DEng, LLB, DSc, LHD, DU, FCAE, PEng, APEO Gold Medal
Vice-Chairman, J.A. George, BSc, MSc, PhD
Secretary, L H.P. Claxton, BA, BLS, MLS

Ex Officio Members
Chancellor, S. Ostry, OC, BA, MA, PhD, LLB (effective May 1, 1991)
Chancellor, J.P.R. Wadsworth, LL.D (term to April 30, 1991)
Chairman, Board of Governors, J.T. Eyton, OC, BA, LLB
President, D.T. Wright, BASc, MS, PhD, DEng, LLB, DSc, LHD, DU, FCAE, PEng, APEO Gold Medal
Vice-President, Academic and Provost, J.A. George, BSc, MSc, PhD
Associate Provost, Academic Affairs, J.G. Kalbkleisch, BSc, MA, PhD
Treasurer, D. Battae
Librarian, M.C. Shepherd, BEd, MA (LS)
Registrar, C.T. Boyes, BA
President, Faculty Association, L.T. Guelke, BSc, MA, PhD
President, Federation of Students, T. Sliwinski
President, Graduate Student Association, N.K. Joannette, BA, MA

The Principal or President of each Federated or Affiliated College
I.L. Campbell, BA, MSc (Principal, Renison)
W. Klassen, BA, BD, PhD (Principal, St. Paul's)
D.R. Letson, BA, MA, PhD (President, St. Jerome's)
R. Sawatsky, BChEd, BA, MA, PhD (President, Conrad Grebel)

The Dean of each Faculty
R.G. Marteniuk, BPE, MA, EdD (Applied Health Sciences)
R.K. Banks, BA, MA, PhD (Arts)
D.J. Burns, BSc, PhD, PEng, CEng (Engineering)
J.H. Bater, BA, MA, PhD (Environmental Studies)
J.D. Kalbfleisch, BSc, MMath, PhD (Mathematics)
J.E. Thompson, BSA, PhD, FRSC (Science)

The Dean of Graduate Studies
J.S. Gardner, BSc, MSc, PhD (term to June 30, 1991)

The Dean of Research
A.J. Carty, BSc, PhD, FRSC, FCIC

Elected Members

Faculty Representatives
To 1991
I.D. Williams, MS, PhD (Applied Health Sciences)
H.M. Lefcourt, BA, MA, PhD (Arts)
R.C.G. Haas, BSc, MSc, PhD, PEng (Engineering)
A. Banerji, BArch, MArch (Environmental Studies)
B. Forte, PhD, DSc, Habil (Mathematics)
G.I. Dmitrienko, BSc, PhD (Science)
C. Abbott, BA, MA, PhD (St. Jerome's)
P. Greenhill, BA, MA, PhD (St. Paul's)
R.G. McLennan, BSc, MSc, PhD (At large)
J.A. Brox, BA, MA, PhD (At large)
I.R. Dagg, BSc, MS, PhD (At large)
R.G.H. Downer, BSc, MSc, PhD, DSc (At large)
V.K. Handa, BSc, BSc (Eng), MSc, MASc, PhD, PEng (At large)
K.W. Hipel, BASc, MASc, PhD, PEng (At large)
S.D. Burt, BA, MA, PhD (At large)
D.A. Ranney, BA, MD, FRCS (At large)

To 1992
R.C.A. Johnson, BA, MA, PhD (Applied Health Sciences)
R.P. Woolstencroft, BA, PhD (Arts)
S.N. Kalra, BSc, MS, PhD, PEng (Engineering)
M.W. Eimitt, National Diploma in Design (Environmental Studies)
F.G. Reynolds, BSc, MSc, EA, FSA, FCIA, MAAA (Mathematics)
E.B. Dumbroff, BSc, MForestry, PhD (Science)
M.W. Higgins, BA, BED, MA, PhD (St. Jerome's)
A.J. Reimer, BChEd, BA, MA, PhD (Conrad Grebel)
H.K. Ellenton, BSc, MA (At large)

R.J. LeRoy, BSc, MSc, PhD (At large)
I.F. Macdonald, BEng, PhD (At large)
W.R. Maunaughton, BA, MA, PhD (At large)
W.R. Needham, BComm, MA, PhD (At large)
C.K.G. Hahn, MASc (At large)

To 1993
P.J. Bishop, BSc, MSc, PhD (Applied Health Sciences)
D.G. John, BA, MA, PhD (Arts)
T.Z. Fahidy, BSc, MSc, PhD, PEng (Engineering)
E.R. Haldenby, BES, BArch (Environmental Studies)
J. Wainwright, BSc, PhD (Mathematics)
J.G. Strong, OD, MSc (Science)
V.F. Golini, BA, MA, PhD (St. Jerome's)
J. Majonis, BA, MA, MSW, PhD (Renison)
G.C. Andrews, BASc, MASc, PhD, PEng (At large)
G.F. Atkinson, MA, PhD, CChem, FRSU, FCIC (At large)
R.A. Aziz, BA, MA, PhD (At large)
D.A. Brisbin, BSc, PhD (At large)
G.A. Griffin, BA, MA, PhD (At large)
J.F. Lawless, BSc, MSc, PhD (At large)
G.C. Woo, OD, MS, PhD, LOSc, FVCO, FAAO, DipLV (At large)

Student Representatives

To 1991
Undergraduate
R.N. Greenwald (Engineering)
J. Hornby (Mathematics)
O.G. DaSilva (At large)

Graduate
R.S. Sharma, BASc (At large)
A. Steinhauer, BSc (At large)

To 1992
Undergraduate
Vacant (Applied Health Sciences)
D. Harrigan (Arts)
Vacant (Environmental Studies/Independent Studies)
N. Messenger (Science)
D. Cunningham (At large)

Graduate
S.R. Dukeshire, BA, MASc (At large)
A.K. Goel, MTech, BE (At large)

Alumni Representatives

To 1991
L. Fairburn, BIS

To 1992
I. Forbes, BASc
G. Young, BA

To 1993
D. Green, BASc, PEng
Board of Governors Representatives
To 1991
Vacancy
Vacancy

To 1992
Vacancy
Vacancy

Note:
More information regarding the Senate and the Board of Governors, their Councils and Committees, may be obtained from the University Secretariat.

Most meetings are open to the University community and are normally announced in the Gazette the week prior to the scheduled meeting date. Senate meets the third Monday of every month, except July and August. Board of Governors meets the first Tuesday of October, February, April and June.

University Offices

Chancellor
S. Ostry, OC, BA, MA, PhD, LLD (effective May 1, 1991)
J.P.R. Wadsworth, LLD (term to April 30, 1991)

Chairman, Board of Governors
J.T. Eyton, OC, BA, LLB

President and Vice-Chancellor
D.T. Wright, BASc, MS, PhD, DEng, LLD, DSc, LHD, DU, FCAE, PEng, APEO Gold Medal

Vice-President, Academic and Provost
J.A. George, BSc, MSc, PhD
P.A.A. Howard, BA
Assistant to the Provost

Advisors to the Vice-President, Academic and Provost
G.A. Griffin, BA, MA, PhD (term to August 31, 1991)
J.A. Legault, BSc, MSc, PhD (effective September 1, 1991)
Advisor on Interdisciplinary Programs
D.A. Brisbin, BSc, PhD
Advisor on Academic Human Resources

Operations Analysis
R.D. Truman, BMath
Director

VICE PRESIDENT, UNIVERSITY RELATIONS
R.G.H. Downer, BSc, MSc, PhD, DSc

Alumni Affairs
J.S. Roberts, BA, MA
Director

Development
Don Livingston, BBA
Director

Information and Public Affairs
M. Van Nierop, BA
Director

UNIVERSITY SECRETARY
L.H.P. Claxton, BA, BLS, MLS

Secretariat
E.M. Barnes
Associate University Secretary
R.J. Bullen, BMath
Associate University Secretary
D.P. Scheifele
Associate University Secretary
T.L. Canning
Assistant University Secretary

Internal Audit
J.E. Buschert, BA, CMA
Director

Security
A.L. MacKenzie, BA
Director

FACULTY OF APPLIED HEALTH SCIENCES
R.G. Marteniuk, BPE, MA, EdD
Dean of Applied Health Sciences
P. Wainwright, BSc, MA, PhD
Associate Dean, Undergraduate Affairs
M.E. Houston, BSc, PhD
Associate Dean, Graduate Affairs
R. Wells, BSc, MEng, PhD
Associate Dean, Computer Affairs and Special Projects
J.D. Carter, BA, CGA
Executive Assistant to the Dean

FACULTY OF ARTS
R.K. Banks, BA, MA, PhD
Dean of Arts
G.A. Griffin, BA, MA, PhD
Associate Dean, Undergraduate Affairs
S.D. Burt, BA, MA, PhD
Associate Dean, Graduate Studies and Research
D.G. John, BA, MA, PhD
Associate Dean, Special Programs
J.A. Brox, BA, MA, PhD
Acting Associate Dean (Computing)
J.F. Wills, BA
Secretary and Administrative Officer
R.L. Knight, AB
Arts Academic Counsellor
I. Mackay, BSc, MSc
Co-ordinator, Mature Student Services
FACULTY OF ENGINEERING
D.J. Burns, BSc, PhD, PEng, CEng
Dean of Engineering
G.E. Schneider, BASc, MASc, PhD
Associate Dean, Undergraduate Studies
B.G. Hutchinson, BE, MSc, PhD
Associate Dean, Graduate Studies and Research
W.J. Wilson, BE, MSc, PhD
Associate Dean for Computing
J.D. Weller, BA, FCA
Executive Assistant to the Dean

FACULTY OF ENVIRONMENTAL STUDIES
J.H. Bater, BA, MA, PhD
Dean of Environmental Studies
G.R. McBoyle, BSc, PhD
Associate Dean, Undergraduate Studies and Educational Liaison
G. Wall, BA, MA, PhD
Associate Dean, Graduate Studies and Research
D. Dudycha, BA, MA, PhD
Associate Dean, Computing and Communications
J.M. Holzinger, BA
Administrative Assistant to the Dean
N. Smale, BA, MASc
Environmental Studies Counsellor

FACULTY OF MATHEMATICS
J.D. Kalbfleisch, BSc, MMath, PhD
Dean of Mathematics
J. Wainwright, BSc, PhD
Associate Dean, Undergraduate Studies
M.E. Thompson, BSc, MSc, PhD
Associate Dean, Graduate Studies and Research
J.P. Black, BSc, Dipl D'Ing, PhD
Associate Dean, Computing, Director, Mathematics Faculty Computing Facility
R.G. Dunkley, BA
Associate Dean, Faculty Programs
S.J. Thomson, BA, MA
Executive Assistant to the Dean

FACULTY OF SCIENCE
J.E. Thompson, BSA, PhD, FRSC
Dean of Science
H.M. Morrison, BSc, PhD
Associate Dean, Undergraduate Affairs
W.B. Kendrick, BSc, PhD, DSc, FRSC
Associate Dean, Graduate Affairs
C.I. Mayfield, BSc, PhD
Associate Dean for Computing
A.P. Cullen, Dip Opt, MSc, OD, PhD, FAAO, FBCO, DCLP
Associate Dean of Science for Optometry
R.J. Friesen, BSc, MSc
Assistant Dean, Special Projects
H. Hahn, BA
Administrative Assistant to the Dean

INDEPENDENT STUDIES PROGRAM
R.H. Holmes, BA, MA, PhD
Academic Board Chair
G.A. Griffin, BA, MA, PhD
Academic Director

UNIVERSITY GRADUATE OFFICE
J.S. Gardner, BSc, MSc, PhD (term to June 30, 1991)
Dean of Graduate Studies
D.L. Judge
Associate Registrar, Graduate Studies

OFFICE OF RESEARCH
A.J. Carty, BSc, PhD, FRSC, FCIC
Dean of Research
A.H. Headlam, MBA, FCA
Director, Research Services and Development
G.I. Clarke, BBA, CMA
Manager, Research Financial Services
E.B. Cross, BASc, PEng
Associate Director, Technology Transfer and Licensing
M.J. Hadley
Associate Director, Research Grants
R.B. Hayward
Contracts Manager
S.R. Jacobs, BSc, DVM
Co-ordinator, Animal Care
R.B. Nally, BSc, MSc, PEng
Consultant, Technology Transfer
P. O’Neill, BA, MA
International Programs Officer
B.C. Scott, BMath, MASc, CGA
Associate Director, Contracts Research
J.P. Sprung, BA, MA
Manager, Software Co-ordination
S.E. Sykes, BA, MASc, PhD
Co-ordinator, Human Research
E. Davison, BSc, PhD, PEng
NRC Industrial Technology Advisor

ASSOCIATE PROVOST, ACADEMIC AFFAIRS
J.G. Kalbfleisch, BSc, MA, PhD

Audio-Visual Centre
G. Downie
Director
R.G. Russell, BAA
Assistant Director, Client Services
J.H. Hilhorst
Assistant Director, Technical Services
W.M. Ritchie
Media Librarian

Co-operative Education and Career Services
J.C. Wilson, BScCE, PEng
Director
T.H. Fitzgerald, BA
Program Administrator, Career Services
W.B. Fuller, BA
Program Administrator, Applied Health Sciences
University Offices

Teaching Resources and Continuing Education
C.K. Knapper, BA, PhD
Director and Teaching Resource Officer
B.A. Lumsden, BA
Associate Director, Distance Education
W. Shalinsky, BA, BSW, MSc, DSW
Senior Associate
S.B.P. Haag, BA, MA, MPhil
Distance Education Advisor
J.H. Willment, BA, MA
Advisor on Teaching and Learning
V.R. Keller, BA
Administrative Assistant

ASSOCIATE PROVOST, COMPUTING AND INFORMATION SYSTEMS
J.W. Wong, BS, MS, PhD

Computing Services
P.H. Dirksen, BSc, MA
Director
J.P. Sprung, BA, MA
Associate Director, Operations
B.E. Uttiey, BMAn7
Associate Director, Systems and Development
R. W. Watt, BSc, MMath
Associate Director, Distributed Computing

Data Processing
J.D. Walker, BA, MASc
Director
Project Managers
E.D. Forster, BSc
R.R. Kempei
D.H. Mason, BMath
W.C. Montgomery, BA

Graphic Services
M.J. Rowe
Director

UW Computer Store
J.W. Dodd, BASc, MSc
Manager

Telephone Services
J. Wiley

ASSOCIATE PROVOST, GENERAL SERVICES
R.J. Elliott, BA

Book Store
V. McCormick
Director

Central Stores and Mail Services
C.A. Lawrence
Director

Personnel
C. Scott, BA
Director

Library
M.C. Shepherd, BEd, MA (LS)
University Librarian

B. MacNeill, BSc, MLS
Associate Librarian, Public Services
C.D. Emery, BA, MPhil, ALA
Associate Librarian, Collections

To be announced
Associate Librarian, Systems

To be announced
Coordinator, Information Services

L. Beattie, BA, MA, PhD
Co-ordinator, Library Administrative Services

S. Bellingham, BA, MLS
Special Collections Librarian

M. Stanley, BA
Library Development Officer

Office of the Registrar
C.T. Boyes, BA
Registrar

B.A. Lumsden, BA
Associate Registrar, Part-Time Studies
J.T. Boniface, BSc
Associate Registrar, Records
K.A. Lavigne, BA
Associate Registrar, Admissions and Student Awards
S.J. Little, BA
Director of Secondary School Liaison
P.F. Burroughs, BA, MSc
Assistant Registrar, Arts, Environmental Studies, Independent Studies
G.L. Buckley
Assistant Registrar, Applied Health Sciences and Engineering
D.L. Kasta, BA, MA
Manager, Continuing Education Liaison Services
B.L. Fretz, BA
Assistant Registrar, Mathematics, Science
B.K. LeDrew, BMath
Assistant Registrar, Scheduling
G.V. Ambrose
Manager, Correspondence Student Services
J. O'Rourke, BA, BEd, MEd
Manager, Course Development Services

Office of the Registrar
C.T. Boyes, BA
Registrar

B.A. Lumsden, BA
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B.K. LeDrew, BMath
Assistant Registrar, Scheduling
G.V. Ambrose
Manager, Correspondence Student Services
J. O'Rourke, BA, BEd, MEd
Manager, Course Development Services
Plant Operations
J.W.G. Sloan, BSc, MICE, CEng, PEng
   Director

Purchasing
D.A. Gardener
   Director

Waste Management Co-ordinator
P. Fraser

DEAN OF STUDENTS
E.S. Lucy, BA

Athletics
W. Delahey, BA
   Director

Bookings
Z. Whittington
   Bookings Agent

Campus Centre
Ann Simpson, BA
   Manager

UW Theatre Centre
Al Anderson
   Manager

Counselling Services
J.L. Williams, BA, MA, PhD
   Director
T.C.E. Casteels-Reis, BA, MEd, EdD
   Counsellor
L.M. Kellar, BA, MASc
   International Student Counsellor
L.J. Thom, BA, MA
   Study Skills Co-ordinator
R.J. Walsh, BA, MASc
   Group Co-ordinator
J.J. Wine, AB, MSc, PhD
   Training Co-ordinator

UW Art Gallery
E. Stieler
   Gallery Administrator

Food Services
R.W. Mudie
   Director

Health and Safety
B. Schumacher, MD
   Medical Director
C. Hea, RN
   Supervisor
D.D. Angove, RN
   Sexual Harassment Advisor
A. Ledbetter, MSW
   Counsellor
J. Reis, BSc, DCS, MEd
   Counsellor
K.A. Stewart, BA, CRSP
   Safety Director

Services for Persons with Disabilities
F. Thomlison, BA
   Co-ordinator

Housing and Residences Operations
H.R.N. Eydt, BSc, MSc, PhD
   Warden of Residences and Director of Housing

TREASURER
D.J. Battae

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W.P. McNamara, CMA
   Director
To be announced
   Associate Director
J.S. Phillips, MCI
   Manager; Accounts Receivable and Credit

Office of Budgets
J.M. Manson, BA, CA
   Director

University Club
J. Staines
   Manager

Honorary Members of the University

Paul Meincke, BSc, PEng
   Date Conferred: May 1985
William G. Scott, BA, MA
   Date Conferred: May 1986
C. Fred MacRae, BA, MA, PhD
   Date Conferred: May 1988
Carl A.W. Totzke, BA
   Date Conferred: May 1990

Professors Emeriti
H.B. Noel Hynes, BSc, PhD, DSc, ARCS, FRSC
   Date Conferred: May 1983
George R. Hibbard, BA, MA, DLitt
   Date Conferred: October 1985
William B. Pearson, DFC, MA, DSc, FRSC, FCIC
   Date Conferred: May 1986
William T. Tutte, BA, MA, PhD, DMath, FRSC, FCIC
   Date Conferred: May 1986
Edward J. Fisher, BA, MA, DSc, FAAO
   Date Conferred: May 1987
W.A.E. (Pete) McBryde, MA, PhD, FCIC
   Date Conferred: May 1987
Jerzy T. Pindera, MSc, PhD, DSc, PEng
   Date Conferred: May 1987
J. William Dyck, AB, MA, PhD
   Date Conferred: May 1988
Francis W. Karasek, BS, PhD, FCIC
   Date Conferred: October 1988
Harold J. Fallding, BA, BSc, MA, PhD, FRSC
   Date Conferred: May 1989
William M. Lyle, OD, MS, PhD, FAAO
   Date Conferred: October 1989
Park M. Reilly, BAsc, DIC, PhD, FCIC, PEng
   Date Conferred: October 1989
Chemical Engineering

The President’s Committee

The President’s Committee was established in 1980 and is composed of friends of the University who annually contribute $1000 or more to the University of Waterloo.

The President’s Committee members play an important role in the development of the University, not only directly through their contributions to UW, but indirectly through the example they set for Corporations and Foundations which are approached to support the University.

**Life Members**

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<tr>
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<td>Waterloo</td>
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<tr>
<td>J.C. Agate</td>
<td>Grimsby</td>
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<td>C. Abbott</td>
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L.R. Brubacher, St. Jacobs
L.J. Brubacher, Waterloo
G.R. Brundie, Oakville
C.G. Brunk, Waterloo
M.D. Bryant, Waterloo
M.P. Bryden, Waterloo
D.C. Bryer, Brockville
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