The Undergraduate Calendar

Except where otherwise indicated, the information in this Calendar applies to the 1987-88 academic year which commences in May, 1987.

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 Arts and the Colleges of Waterloo
* Faculty of Engineering
* Faculty of Environmental Studies
* Faculty of Human Kinetics and Leisure Studies
* Faculty of Mathematics
* Faculty of Science
* Independent Studies Program

Those marked * 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 reserve the right to invoke changes in this Calendar without prior notice.

The University has developed a number of services to assist students with physical disabilities. More information is on page 1:14 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. Needles 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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Disciplines are also available as Minors and Joint Honours programs.

Programs normally fulfill the academic requirements for registration in the related professions. Pertinent sectors of the Calendar consulted.
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, Pass, 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 another course which lists it as a corequisite.

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 p. 1:7.

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 an honours student 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 (Physics Option), or in a career-oriented area, such as Honours Physics (Business Administration Option), or Honours Mathematics (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.

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.)

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.
## Academic Calendar – 1987

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
<th>Day</th>
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<tbody>
<tr>
<td>Preregistration Begins – Undergraduate Programs – Fall Term</td>
<td>March 2</td>
<td>Monday</td>
</tr>
<tr>
<td>Preregistration Ends – Undergraduate Programs – Fall Term</td>
<td>March 6</td>
<td>Friday</td>
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<tr>
<td>Meeting – University Senate, 7:30 p.m.</td>
<td>March 16</td>
<td>Monday</td>
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<tr>
<td>Meeting – Board of Governors Executive Committee</td>
<td>March 24</td>
<td>Tuesday</td>
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<tr>
<td>Course-Change Deadline – Correspondence – Spring Term</td>
<td>March 27</td>
<td>Friday</td>
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<tr>
<td>Lectures End – Winter Term</td>
<td>April 1</td>
<td>Wednesday</td>
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<tr>
<td>Examinations Begin – Winter Term</td>
<td>April 4</td>
<td>Saturday</td>
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<tr>
<td>Meeting – Senate Executive Committee</td>
<td>April 6</td>
<td>Monday</td>
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<tr>
<td>Meeting – Board of Governors, 4:30 p.m.</td>
<td>April 7</td>
<td>Tuesday</td>
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<td>Course-Drop or Withdrawal Deadline – Correspondence – Winter Term</td>
<td>April 15</td>
<td>Wednesday</td>
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<tr>
<td>Good Friday – University Holiday*</td>
<td>April 17</td>
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<td>April 20</td>
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<td>Examinations End – Winter Term</td>
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<td>Final Examination Results Due – Winter Term</td>
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<td>Friday</td>
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<td>Examinations – Correspondence – Winter Term</td>
<td>May 2</td>
<td>Saturday</td>
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<td>Meeting – Senate Executive Committee</td>
<td>May 4</td>
<td>Monday</td>
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<tr>
<td>Registration – Undergraduate Programs – Spring Term</td>
<td>May 4</td>
<td>Monday</td>
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<tr>
<td>Registration – Graduate Studies – Spring Term</td>
<td>May 4</td>
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<tr>
<td>Lectures Begin – Engineering and Science Courses – Spring Term</td>
<td>May 4</td>
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<td>May 5</td>
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<tr>
<td>Spring Convocation (Arts, Human Kinetics and Leisure Studies)</td>
<td>May 28</td>
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<td>Spring Convocation (Environmental Studies, Independent Studies, Science)</td>
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<tr>
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*Some University Departments may be open for limited service on these days.*
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| Christmas Holidays*                                  | December 25-| Friday-
|                                                      | December 31| Thursday|

*Some University Departments may be open for limited service on these days.*
### 1988

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<td>Final Examination Results Due – Fall Term</td>
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<td>Registration – Undergraduate &amp; Graduate Programs – Winter Term</td>
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<tr>
<td>Lectures Begin – Engineering and Science Courses – Winter Term</td>
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<td>Meeting – University Senate, 7:30 p.m.</td>
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<tr>
<td>Meeting – Senate Executive Committee</td>
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<tr>
<td>Study Week Begins – Arts &amp; Environmental Studies</td>
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<tr>
<td>Meeting – Senate Executive Committee</td>
<td>March 7</td>
<td>Monday</td>
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<tr>
<td>Preregistration Begins – Undergraduate Programs – Fall Term</td>
<td>March 7</td>
<td>Monday</td>
</tr>
<tr>
<td>Preregistration Ends – Undergraduate Programs – Fall Term</td>
<td>March 11</td>
<td>Friday</td>
</tr>
<tr>
<td>Meeting – University Senate, 7:30 p.m.</td>
<td>March 21</td>
<td>Monday</td>
</tr>
<tr>
<td>Meeting – Board of Governors Executive Committee</td>
<td>March 22</td>
<td>Tuesday</td>
</tr>
<tr>
<td>Lectures End – Winter Term</td>
<td>March 30</td>
<td>Wednesday</td>
</tr>
<tr>
<td>Course-Change Deadline – Correspondence – Spring Term</td>
<td>March 31</td>
<td>Thursday</td>
</tr>
<tr>
<td>Good Friday – University Holiday*</td>
<td>April 1</td>
<td>Friday</td>
</tr>
<tr>
<td>Examinations Begin – Winter Term</td>
<td>April 4</td>
<td>Monday</td>
</tr>
<tr>
<td>Meeting – Senate Executive Committee</td>
<td>April 4</td>
<td>Monday</td>
</tr>
<tr>
<td>Meeting – Board of Governors, 4:30 p.m.</td>
<td>April 5</td>
<td>Tuesday</td>
</tr>
<tr>
<td>Meeting – University Senate, 7:30 p.m.</td>
<td>April 18</td>
<td>Monday</td>
</tr>
<tr>
<td>Course – Drop or Withdrawal Deadline – Correspondence – Winter Term</td>
<td>April 20</td>
<td>Wednesday</td>
</tr>
<tr>
<td>Examinations End – Winter Term</td>
<td>April 22</td>
<td>Friday</td>
</tr>
<tr>
<td>Final Examinations Results Due – Winter Term</td>
<td>April 29</td>
<td>Friday</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
<th>Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meeting – Senate Executive Committee</td>
<td>May 2</td>
<td>Monday</td>
</tr>
<tr>
<td>Registration – Undergraduate &amp; Graduate Programs – Spring Term</td>
<td>May 2</td>
<td>Monday</td>
</tr>
<tr>
<td>Lectures Begin – Engineering and Science Courses – Spring Term</td>
<td>May 2</td>
<td>Monday</td>
</tr>
<tr>
<td>Lectures Begin – Other Courses – Spring Term</td>
<td>May 3</td>
<td>Tuesday</td>
</tr>
<tr>
<td>Start of Late Fees – Spring Term</td>
<td>May 3</td>
<td>Tuesday</td>
</tr>
<tr>
<td>Examinations – Correspondence – Winter Term</td>
<td>May 7</td>
<td>Saturday</td>
</tr>
<tr>
<td>Meeting – University Senate, 7:30 p.m.</td>
<td>May 16</td>
<td>Monday</td>
</tr>
<tr>
<td>Victoria Day – University Holiday*</td>
<td>May 23</td>
<td>Monday</td>
</tr>
<tr>
<td>Meeting – Board of Governors Executive Committee</td>
<td>May 24</td>
<td>Tuesday</td>
</tr>
<tr>
<td>End of Course-Change Period – Spring Term – See Individual Faculty Chapters</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Some University Departments may be open for limited service on these days.*
<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
<th>Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring Convocation (Arts, Human Kinetics and Leisure Studies)</td>
<td>May 26</td>
<td>Thursday</td>
</tr>
<tr>
<td>Spring Convocation (Environmental Studies, Independent Studies, Science)</td>
<td>May 27</td>
<td>Friday</td>
</tr>
<tr>
<td>Spring Convocation (Engineering, Mathematics)</td>
<td>May 28</td>
<td>Saturday</td>
</tr>
<tr>
<td>Examination Results Due – Correspondence – Winter Term</td>
<td>June 3</td>
<td>Friday</td>
</tr>
<tr>
<td>Meeting – Senate Executive Committee</td>
<td>June 6</td>
<td>Monday</td>
</tr>
<tr>
<td>Meeting – Board of Governors, 4:30 p.m.</td>
<td>June 7</td>
<td>Tuesday</td>
</tr>
<tr>
<td>Preregistration Begins – Co-operative Programs – Winter Term</td>
<td>June 15</td>
<td>Wednesday</td>
</tr>
<tr>
<td>Preregistration Ends – Co-operative Programs – Winter Term</td>
<td>June 17</td>
<td>Friday</td>
</tr>
<tr>
<td>Meeting – University Senate, 7:30 p.m.</td>
<td>June 20</td>
<td>Monday</td>
</tr>
<tr>
<td>Canada Day – University Holiday*</td>
<td>July 1</td>
<td>Friday</td>
</tr>
<tr>
<td>Registration – Summer Session</td>
<td>July 4</td>
<td>Monday</td>
</tr>
<tr>
<td>Lectures Begin – Summer Session</td>
<td>July 4</td>
<td>Monday</td>
</tr>
<tr>
<td>Start of Late Fees – Summer Session</td>
<td>July 5</td>
<td>Tuesday</td>
</tr>
<tr>
<td>Course – Drop or Withdrawal Deadline – Correspondence – Summer Term</td>
<td>July 26</td>
<td>Tuesday</td>
</tr>
<tr>
<td>Lectures End – Spring Term</td>
<td>July 29</td>
<td>Friday</td>
</tr>
<tr>
<td>Civic Holiday – University Holiday*</td>
<td>August 1</td>
<td>Monday</td>
</tr>
<tr>
<td>Examinations Begin – Spring Term</td>
<td>August 2</td>
<td>Tuesday</td>
</tr>
<tr>
<td>Lectures End – Summer Session</td>
<td>August 12</td>
<td>Friday</td>
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<tr>
<td>Examinations – Correspondence – Spring Term</td>
<td>August 13</td>
<td>Saturday</td>
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<tr>
<td>Examinations End – Spring Term</td>
<td>August 13</td>
<td>Saturday</td>
</tr>
<tr>
<td>Examinations – Summer Session</td>
<td>August 13</td>
<td>Saturday</td>
</tr>
<tr>
<td>Final Examination Results Due – Spring; Summer</td>
<td>August 19</td>
<td>Friday</td>
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<tr>
<td>Examination Results Due – Correspondence – Spring Term</td>
<td>August 31</td>
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*Some University Departments may be open for limited service on these days.
### 1987

<table>
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<td>5 6 7 8 9 10 11</td>
<td>4 5 6 7 8 9 10</td>
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### 1988

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<tbody>
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<td>3 4 5 6 7 8 9</td>
<td>2 3 4 5 6 7 8</td>
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<tr>
<td>31</td>
<td>24 25 26 27 28 29 30</td>
<td>31</td>
<td>29 30</td>
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</tbody>
</table>

### 1989

<table>
<thead>
<tr>
<th>January 1 2 3 4 5 6 7</th>
<th>April 1</th>
<th>July 1</th>
<th>October 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 2 3 4</td>
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<td>1 2 3 4 5</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
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<td>2 3 4 5 6 7 8</td>
<td>9 10 11 12 13 14 15</td>
<td>8 9 10 11 12 13 14 15</td>
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<tr>
<td>15 16 17 18 19 20 21 22</td>
<td>10 11 12 13 14 15 16 17</td>
<td>15 16 17 18 19 20 21</td>
<td>15 16 17 18 19 20 21</td>
</tr>
<tr>
<td>30 31</td>
<td>23 24 25 26 27 28 29</td>
<td>30</td>
<td>29 30</td>
</tr>
</tbody>
</table>

### Diagram

- January
- April
- July
- October
There are two routes to the UW Campus from Hwy 401. The first route is to exit at Hwy 8 to Kitchener; enter the Conestoga Parkway by following Hwy 7 East signs; then follow the Parkway 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 Parkway; enter the Parkway following Hwy 7 & 8 West Stratford; continue on the Parkway and exit at Fischer Dr. outlet. Turn left at the Fischer-Hallman Dr. traffic lights and continue north west along Fischer. Fischer Dr. becomes Hallman Rd. at Erb St.; continue on Hallman Rd. until you reach Columbia Dr. Turn right on to Columbia and drive easterly until you reach the University of Waterloo.
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 Offerings 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 four 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 last division of the Calendar describes the general administrative structure of the University.

Except where otherwise indicated, the information in this Calendar applies to the 1987-88 academic year which commences in May, 1987.

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 graduate level. The University is co-educational and non-denominational. Programs are offered in Arts, Engineering, Environmental Studies, Human Kinetics and Leisure 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 1,000-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 200,000.

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 and Coat of Arms

The official colours of the University of Waterloo are gold, black, and white. The coat of arms for the University of Waterloo, as adopted in October 1961, is:

Arms

Or, a chevron sable surmounted by a chevronell argent between three lions rampant, gules.

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 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 Arts, The Faculty of Engineering, The Faculty of Environmental Studies, The Faculty of Human Kinetics and Leisure 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 (anticipated as of November 1, 1966):

<table>
<thead>
<tr>
<th>Faculty of Arts</th>
<th>Full Time</th>
<th>Part Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Faculty of Engineering</td>
<td>2918</td>
<td>313</td>
</tr>
<tr>
<td>Faculty of Environmental Studies</td>
<td>1132</td>
<td>398</td>
</tr>
<tr>
<td>Faculty of Human Kinetics and Leisure Studies</td>
<td>1086</td>
<td>27</td>
</tr>
<tr>
<td>Independent Studies Program</td>
<td>56</td>
<td>-</td>
</tr>
<tr>
<td>Faculty of Mathematics</td>
<td>3049</td>
<td>583</td>
</tr>
<tr>
<td>Faculty of Science</td>
<td>2233</td>
<td>1504</td>
</tr>
<tr>
<td>Total Undergraduate Enrolment</td>
<td>14012</td>
<td>9188</td>
</tr>
<tr>
<td>Graduate Student Enrolment</td>
<td>1352</td>
<td>406</td>
</tr>
</tbody>
</table>

The Church Colleges

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

University of St. Jerome's College
The University of St. Jerome's College is a liberal arts college affiliated formerly with the University of Ottawa before entering into federation with the University of Waterloo in 1960. Students admitted to UW can register at St. Jerome's in all Regular programs and some Co-operative programs in the Faculty of Arts, and in all Regular and Co-operative programs in the Faculty of Mathematics.

St. Jerome's students choose courses offered at the College, other affiliated Colleges, or the six UW Faculties. Graduates of the College receive University of Waterloo degrees. The St. Jerome's campus includes a teaching and administrative building, a library, an auditorium complex, a men's residence (126 students) and a women's residence, Notre Dame College, operated by the School Sisters of Notre Dame (122 students). The University of St. Jerome's College is conducted by the Congregation of the Resurrection.

Renison College
Renison College was founded by a group of Anglicans committed to the principle of a small residence-teaching community. The College offers the advantages of study in a small college with the resources of a major university.

Academic offerings at Renison serve students registered in:

a) Social Development Studies, and
b) General Arts.

Social Development Studies is an interdisciplinary program of courses in Social Work, Psychology, Sociology and Interdisciplinary Social Science leading to a BA of the University of Waterloo with emphasis on both classroom study and community involvement. The College also offers courses in English, Fine Arts, Geography and Religious Studies. Renison College Faculty members and courses are indicated by an R suffix in this Calendar.

The College has two residences accommodating 98 men and 74 women.

Conrad Grebel College
Conrad Grebel College is a Mennonite church sponsored school providing residential, teaching, research and adult studies programs from a Christian perspective. The residence accommodates 115 students in an intimate atmosphere which emphasizes interpersonal relationships and community responsibility. College-sponsored extra-curricular programs in music, sports and the chapel significantly complement the academic life of the student. Students from all backgrounds and world-views are welcome, subject to their willingness to abide by the College's values. Additionally, an Associate Student program allows University of Waterloo students to enter the life of the college community without living here.

Application forms for both the residence and for associate student status are available at the College.

Academically the College offers courses described in the Arts, History, Philosophy, Religious Studies and Sociology sections of this Calendar. Also found in this Calendar are the Peace and Conflict Studies and Music programs offered and administered by this College. These courses and programs are fully integrated into the University curriculum and are available to all students of the University. Students register for CGC courses through the University or through Renison or St. Jerome's Colleges.
St. Paul's College
St. Paul's United College is a teaching and residential community of 150 men and women.

The College offers two Interdisciplinary Options which students may take in conjunction with degree programs at the University of Waterloo. 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.

Students should consult the appropriate section of the University Calendar for more information about these two Options.

The College 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.

There is an attempt on the part of the College to integrate its academic life with life in the residence. In this regard, one section of the residence is designated “The French Residence” which offers native English-speaking students, who have achieved some competence in French, an opportunity to further develop the French language. This program is offered in co-operation with the French Department.

Resident life in the College provides a valuable contribution to university experience beyond that which comes from courses taken for credit. Through a program 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 the College participate in a vital and enriching community.

Degrees Offered
The University of Waterloo offers the following undergraduate degrees:

- Bachelor of Architecture (BArch)
- Bachelor of Arts (BA)
- Bachelor of Applied Science (BASc)
- 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
Degrees Offered
Systems of Study

The University of Waterloo offers the following graduate degrees:

- Master of Accounting (MAcc)
- Master of Arts (MA)
- Master of Applied Science (MASc)
- Master of Mathematics (MMath)
- Master of Philosophy (MPhil)
- Master of Science (MSc)
- 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)

Systems of Study
The University offers students 2 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 8-month academic year from September to April.

Co-operative System
Students studying under the Co-operative System alternate academic terms on campus with work terms off campus in business, industry, or government. Further information about the Co-operative System can be found in Chapter 5.
Part-Time Studies, Correspondence Courses, and Continuing Education

The Teaching Resource and Continuing Education (TRACE) Office, under the direction of Dr. Christopher Knapper, is responsible for major policy development and co-ordination of activities related to part-time studies, correspondence courses, and continuing education. The organizational structure of the office is outlined in Chapter 17.

The University of Waterloo, which offers a wide variety of options for part-time learning, encourages students to continue their education through credit or non-credit courses; in a classroom or by distance education; during the day or in the evening.

For most purposes students will deal with the administrative staff located in a building off-campus at 156 Columbia Street (corner of Columbia and Phillip Streets). General inquiries, admission/registration questions and information on the resources and opportunities available to part-time students can be handled during the usual working hours of 8:30 a.m. to 4:30 p.m. During the first week of classes each term, the office is open until 7:00 p.m.

No academic distinction is made between part-time and full-time students, either in admission standards, grading practices or promotion policies.

The great majority of part-time students are adults, and most are considered for admission under UW's Adult Student Admission Policy. Tuition fees are assessed on a per course basis, and for students over 60 years of age a bursary is available which covers the full fee.

The Fall and Winter Part-Time Studies Calendar and the Spring and Summer Bulletin, both published annually, list all courses offered in the late afternoon and evening, and provide complete details of admission requirement, registration procedures, and general services for part-time students. The Calendar of Correspondence Courses describes the University's extensive range of distance education courses and also provides other relevant administrative details concerning the program.

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 course information file, a learning skills package, a buddy system, 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.

Part-Time Studies on Campus

Part-time students often enrol in classes scheduled in the evening or in late afternoon. However, part-time students are welcome to enrol in daytime classes as well. Students may earn most degrees (the engineering degree is one exception) entirely through part-time studies or by a combination of part-time and full-time attendance. For some programs in HKLS, Math, 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.

Part-Time Studies off Campus

Several University of Waterloo credit courses are now offered each year in community centres such as Kitchener and Waterloo, Cambridge, and Halton Hills. 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, if they wish, apply them toward a degree with credits earned on campus or through correspondence courses.

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

Correspondence Courses

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 method of operation, the fee structure, and the application deadlines. For application deadlines see also p. 2:8 of this Calendar.

General degrees in Arts, Environmental Studies, and Science may be earned entirely through correspondence. In working toward their 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 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:

The University of Waterloo
Part-Time Studies, Correspondence Courses,
and Continuing Education
Correspondence Office
University of Waterloo
Waterloo, Ontario N2L 3GL
(519) 888-4050

B.Sc.N. 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. These courses are available on campus or through correspondence. Further information is available from the Faculty of Nursing, University of Western Ontario, or from Part-Time Studies, University of Waterloo.

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 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 Certificate 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:

The University of Waterloo
Part-Time Studies, Correspondence Courses, and Continuing Education
Cross-registration with Wilfrid Laurier University

- Appraisal Institute of Canada
- Canadian Hospital Association Course in Health Services Management
- Canadian Institute of Certified Administration Managers Program (CAM)
- Institute for Certified Professional Secretaries (ICPS)
- Canadian Institute of Traffic and Transportation
- Certified General Accountants Association of Ontario (CGA)
- Institute of Chartered Accountants of Ontario (CA)
- Institute of Municipal Management Program
- Insurance Institute of Canada Fellowship Program
- Ontario Hospital Association Certified Health Consultant Program
- Purchasing Management Association of Canada
- Real Estate Institute of Canada (FRI)
- Society of Management Accountants of Ontario (RIA)
- Trust Companies Institute

Non-Credit Courses
The University offers some non-credit courses throughout the year on such topics as Understanding Microcomputers, Creating New Products, and Protecting Your Ideas.

Inquiries
Inquiries concerning part-time studies, off-campus courses, diploma programs and continuing education opportunities should be directed to:
Part-Time Studies
University of Waterloo
Waterloo, Ontario N2L 3GL
(519) 888-4002

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 University of Waterloo
Grading System

Students must pay all fees at their home university regardless of the number of courses taken by Cross-registration. The basic academic regulations, prerequisites for courses, grading systems etc., of the host university will be applicable. Grades are reported to the student's home university based on the grading system of the host university and are combined with the results of 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-registered 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</th>
<th>Common</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>
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<tr>
<td>B+</td>
<td>78</td>
<td>77-79</td>
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<tr>
<td>C+</td>
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<td>35-41</td>
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<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 Aegrotat, 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

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 so inform their instructors and 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 7-10 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.

The University of Waterloo
Examination Regulations

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 Chairman 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.

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.
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.

**Academic Regulations and Student Discipline**

As provided in the University of Waterloo Act, 1972, disciplinary jurisdiction with respect to all students of the University is vested in the Board of Governors. The Board of Governors may delegate its authority to the President and the President in turn may delegate authority to the Deans, except that the President may not delegate the power to expel a student from the University.

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 the University Senate on April 20, 1981:

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

**II. Academic Offences**

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

**III. Jurisdiction and Principles.**

Problems which cannot be resolved between the professor(s) and the student(s) will be referred to the Faculty Advisory Committee on Academic Discipline.

**IV. Penalties.**

Should a student be found guilty of committing an academic offense, the penalty recommended will be one or more of the following:

1. Reprimand.
2. Submission of a failing grade in an examination, test, assignment, course, or term.
3. Probation.
4. Suspension.
5. Expulsion.

**V. Right of Appeal.**

Students shall have the right to appeal a recommendation of the Faculty Advisory Committee on Academic Discipline to the Dean of the Faculty, and to appeal a decision of the Dean to the President of the University.

Copies of the Regulations in full are available on request from the University Secretariat, the Office of the Registrar and the Office of the Dean of each Faculty.

**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 license 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.*
The Executive Board is composed of the principal officers including the President, Vice-President Operations and Finance, the Vice-President University Affairs, all Board Chairpersons, and all Commission Commissioners. 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 the Federation Budget, the Federation's Ancillary Services and other services such as Fed Flicks, the Toronto Bus Service, SCOOPS, the Legal Resource Office, Women's Centre and Birth Control Centre. This Vice-President also oversees the Boards of Entertainment, Communication and Creative Arts.

The Vice-President University Affairs is directly responsible to Council, to make sure they 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, Education, Internal Liaison and Women's Commission.

The Athletic Commission provides a means for the expression of athletic concerns that relate to the student on all levels; from the promotion of, to the participation in, sport.

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 annual student handbook, as well as calendars, flyers, and information published less frequently.

The Board of Entertainment co-ordinates and supervises all campus-wide programs such as Orientation, Homecoming, Winter Carnival, 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 Education Commission works to provide an out-of-the classroom education, sponsors programs and speakers on campus to broaden the student-learning experience.

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

The Women's Commission 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 Ombudsman 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 Ombudsman deals with situations both academic and non-academic in nature. The Ombudsman'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 WORDS - a Word Processing Service, the Record Store, Campus Shop, Post Office, Used Books Store, the Bombshelter Pub and Patio, Federation Hall, Chinese Library, and Classical Record Library.

Persons wishing more 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, with the assistance of a Student Board, offers a place for the University community to meet, relax or take advantage of the many facilities in the building. Open around the clock every day of the year, the CCB offers nonstop 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 the news 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-monthly over the Summer.
Student volunteers are needed perpetually to typeset copy, design pages, research and write stories, take photos, review everything from books to concerts, organize departments, and keep accounts. 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. at 888-4048 or University ext. 2331 Monday through Friday. Inquiries 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 Association with 15 other Ontario universities, and competes in over 40 sports in this inter-university league. Campus Recreation provides an intramural program at a competitive, recreational, and instructional level, including such sports as slow-pitch, softball, 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 Complex.

**Book Store**
**South Campus Hall**
Text books, general interest books and supplies are available at the University Book Store. Crested items are available at the Open Door Gift Shop, across from the Book Store. Normal hours are 9:00 a.m. to 5:00 p.m. Monday through Friday. Extended hours will be posted.

**Centre for the Arts**
**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. The UW Arts Centre offers a series of professional shows in comedy, stage, popular and Classical Music and children's entertainment.

The Humanities Theatre, located in Hagey Hall is a 721 seat Theatre with one balcony and a proscenium stage. Most of the professional shows take place here, including the International Film series screenings. The Theatre of the Arts, located in the Modern Languages building, is modelled after the Stratford Festival Theatre. It is the smaller of the two theatres, seating just over 500 people and is the scene of the Chamber Music Series, Drama presentations and various other campus events.

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 to community organizations such as local dance schools, the Kiwanis Club, Gilbert and Sullivan Society and more. The UW Arts Centre general offices and box office 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 service. The UW Arts Centre Box Office is a BASS ticket outlet, supplying tickets to the Humanities Theatre, the Theatre of the Arts and any event on the BASS ticket system. Visa and Mastercard are accepted for phone orders.

**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, group counselling 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 Information Centre**
**Room 1115, Needles Hall**
The Career Information Centre contains material which assists students in career choices, the job search and employer information. Summer and part-time jobs are also handled by the Career Information Centre. For more information see page 5:8.

**Health and Safety Department**
**Health and Safety Department Building**
The Health and Safety Department is the Medical clinic centrally located on campus. It provides comprehensive care to all students and emergency care to anyone 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 for by the Ontario Health Insurance Plan. More details are given in *The Ontario Health Insurance Plan General Guide* available without cost at the Health and Safety Department.

All full-time students are also covered by a Student Supplementary Health Insurance Plan which provides partial payment for prescriptions and other services.
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 course information file, a learning skills package, a buddy system, 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.

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 development of research policy; liaison with outside organizations; distribution of grant information and regulations; processing of faculty grant applications; development and administration of contracts; liaison, development and administration of international projects; development of the University Research/Technology Park; and financial administration for all research activities.

Among the functions of the Office of Research are the following: to ensure that University policies and agency/sponsor requirements are met, to act as a centre of communications between granting agencies and faculty, to assist faculty in obtaining grants and contracts for undertaking research, and to provide administrative and financial monitoring and reporting to researchers and external sponsors.

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: With its responsibility for contract research the Office of Research has absorbed the Waterloo Research Institute, formerly the Industrial Research Institute established in 1967. In this regard the Office of Research is the organization through which research and development assistance on a contract basis can be made available to industry, governments and other sectors of society. The Office of Research provides a working liaison between the University and all organizations in which contracted research offers potential assistance and draws upon the resources of all Faculties of the University in providing research services on a contractual basis.

3. Research Involving Human Subjects: The Co-ordinator (Human Research), in consultation with members of the Committee on Research Involving Human Subjects, reviews University research proposals involving human subjects as to ethical acceptability, legal liability and medical advisability. As the official liaison officer between the University and local public and separate school boards, the Co-ordinator is also responsible for obtaining school age children as subjects for suitable University research projects.

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. It is the responsibility of the Committee to co-ordinate and review all 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. The Office also provides financial administration and logistical assistance.

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 co-operation at all levels.

Residences
Accommodation is available at the University for approximately 4,000 students. There are two large undergraduate residences, Village I and Village II; five smaller Federated & Affiliated College residences, St. Jerome's, Notre Dame, Conrad Grebel, Renison, and St. Paul's; the Minota 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, and Minota 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) 885-1271

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

Conrad Grebel College,
Westmount Rd. N.,
Waterloo, Ontario N2L 3G8
or phone (519) 885-0220

Married Students' Apartments,
159 University Ave. W.,
Room 0104,
Waterloo, Ontario N2L 3E8
or phone (519) 884-0310

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

Renison College,
Westmount Rd. N.,
Waterloo, Ontario N2L 3G4
or phone (519) 884-4400

St. Jerome's College,
Waterloo, Ontario N2L 3G3
or phone (519) 884-8110

St. Paul's United College,
Waterloo, Ontario N2L 3G5
or phone (519) 885-1460

Waterloo Co-operative Residence Inc.,
280 Phillip St.,
Waterloo, Ontario N2L 3X1
or phone (519) 884-3670

Facilities for Physically Disabled Students
The University has developed a number of services to assist 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.

Both Village I and II have 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 including a Kurzweil reading machine, has been established in the Optometry Department to aid visually disabled students. For information call ext. 3581.

The Library has a listening room equipped with four-track tape recorders and a Braille. The Library staff will also provide assistance for disabled students.

The Co-ordinator of Services for Disabled Persons will assist disabled students to access campus services and facilities. For information or assistance, call ext. 2993. Off-campus TTY/TDD users may call 888-4044. On-campus TTY/TDD users call ext. 4044.

Foreign Student Office
The Foreign Student Office (FSO) located on the second floor of Needles Hall (within Counselling Services) aids foreign 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 Families, International Friends, English conversation class, emergency loans, English tutors, and temporary housing.

All students from outside Canada are invited to visit the Foreign Student Office, Needles Hall, Room 2089, ext. 2914. 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 1976, 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 new 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 Needles Hall, Room 3005 (ext. 2579), and includes a library of computer-catalogued resource materials.
Visitors Reception Centre
The centre, located in Optometry, Room 306, 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 1½ 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.
Admissions
General Information
General Admission Requirements

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

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.

Authority to Admit
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 Early Admission made to an Ontario secondary school student if the applicant fails to complete diploma requirements with a minimum final overall average of 60% in six Grade 13 or Ontario Academic Course credits or with any other specific final average or 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.

English Proficiency Test
Applicants whose 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. If applying to Co-operative Engineering programs, Permanent Residents must have completed at least one year of formal academic study or have one year's work experience in Canada before applying for admission.

**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 1**

**A) Applicants From Ontario Secondary Schools**

See the 1987-88 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 system used.

**Applicants from Other Canadian Provinces**

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

**Applicants from Other Countries**

**Countries following a "British" System of Education**

General Certificate of Education or equivalent with Passes in at least five subjects, two of which must be at the Advanced Level. Credits on the 'School Certificate' or Subsidiary Passes on the 'Higher School Certificate' of recognized examining bodies will be accepted as equivalent to Ordinary Level Passes on the G.C.E. and Principal or Main Passes on the ‘Higher School Certificate’ as equivalent to Advanced Level Passes.

**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 of mature age who have been away from formal education for more than two years and who do not possess the minimum requirements for admission, stated in terms of Ontario secondary school preparation, may apply as mature students.

Applicants applying as mature students are advised to contact the Assistant Registrar of the desired Faculty to discuss admissibility and appropriate qualifying work. Generally, it is recommended that applicants who are applying to enter the University as mature students attempt to obtain standing in at least one university-entrance level subject (or its equivalent) that relates to the program of interest. Applicants to programs requiring specific subject prerequisites normally must have standing in these required subjects to be considered for admission. Mature students not meeting the requirements for degree candidacy may in certain cases be admitted to degree studies on a part-time probationary basis. Each application is considered on its own merit by the Admissions Committee.

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.

Admissions
Other Applicants

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 Faculty Program Recommendations and Requirements for Year 1 Programs

<table>
<thead>
<tr>
<th>Faculty/Program</th>
<th>Required University-Entrance Subjects and Minimum Averages</th>
<th>Recommendations</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The Ontario Universities' Admission Centre (OUAC) code</strong></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.</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. The University reserves the right to withdraw the offer of Early Admission to any student who is not admitted to the program they have applied for in their first-choice program.</td>
</tr>
<tr>
<td>Culture and Humanities</td>
<td>Six Grade 13 or Ontario Academic Course credits including English.</td>
<td>Along with the credit in English, preferably a course that stresses writing skills, applicants should take university-entrance level courses such as History and languages other than English. A Mathematics course is recommended for applicants who are considering social science programs.</td>
<td>Applicants with averages over 75% will be given first consideration. Applicants with lower averages, however, are admitted on the basis of other indicators. Admission to Departmental programs occurs following Year One. An exception is Social Development Studies which generally admits students at the beginning of the first year.</td>
</tr>
<tr>
<td>Regular</td>
<td>OUAC codes: University - WA, St. Jerome's - WJA, Renison (Social Development Studies) - WRA</td>
<td></td>
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</tr>
<tr>
<td>Regular (Accountancy Studies)</td>
<td>OUAC code: WAA</td>
<td>Six Grade 13 or Ontario Academic Course credits including English.</td>
<td>Along with the credit in English, preferably a course that stresses writing skills, applicants should take university-entrance level courses in Algebra and Calculus. Students lacking Algebra and/or Calculus must rectify this deficiency in Year One.</td>
</tr>
<tr>
<td>Co-op (Accountancy Studies)</td>
<td>OUAC code: WAA</td>
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</tr>
<tr>
<td>Co-op (Applied Studies)</td>
<td>OUAC code: WQ</td>
<td>Six Grade 13 or Ontario Academic Course credits including English.</td>
<td>Along with the credit in English, preferably a course that stresses writing skills, applicants should take university-entrance level courses such as History, Mathematics, a second language, and Science.</td>
</tr>
</tbody>
</table>

*Note:* Ontario secondary school students seeking admission in September 1985 or thereafter, must present the Secondary School Honour Graduation Diploma (SSHGD) or Ontario Secondary School Diploma (OSSD) including a minimum of six Grade 13 or Ontario Academic Course credits. An overall average of 80% on six Grade 13 or 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 in those programs. The actual averages required for admission to particular programs are determined each year on the basis of the number of applicants and the marks of those applicants. The Secondary School Honour Graduation Diploma and the Ontario Secondary School Diploma will normally be given equal credit for admission purposes. 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 provided the student has proceeded normally through the program without repeating any courses or credits. As the Ontario Academic Course curriculum guidelines are implemented, it is expected that some specific subject requirements for admission will change. The Faculty of Engineering and the Faculty of Mathematics anticipate that their subject requirements in the area of Mathematics will be reduced from three Grade 13 credits (Algebra, Calculus, Relations & Functions) to two. The Faculty of Science anticipates a change in the methodology of the University's ranking of students with the addition of an Ontario Academic Course in English. Subject requirements for Kinesiology are expected to become an Ontario Academic Course in Calculus plus two Science courses from Biology, Chemistry, Physics. All admission requirement changes will be publicized at least one year before being implemented. The University reserves the right to withdraw the offer of Early Admission to any student who is not admitted to the program they have applied for in their first-choice program.
## Admissions
### Specific Faculty Program Recommendations and Requirements

<table>
<thead>
<tr>
<th>Faculty/Program</th>
<th>Required University-Entrance Subjects and Minimum Averages</th>
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<th>Comments</th>
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</thead>
<tbody>
<tr>
<td><strong>Engineering</strong></td>
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<tr>
<td>OUAC codes for Engineering (Co-op)</td>
<td>Six Grade 13 or Ontario Academic Course credits including Calculus, Algebra, Relations &amp; Functions, Physics, and Chemistry.</td>
<td>Applicants with high numeric overall standing who are missing one or two of the five specific requirements must contact the Admissions Officer no later than December for September admission. Applicants will be evaluated and advised on the courses of action required to meet the specific requirements. Since Engineering requires considerable writing of reports and reviews as well as the reading of books, articles and journals, the sixth credit for admission should be a subject requiring literary skills such as English, History, or Geography. It is also recommended that applicants include a Computer Science course in their high school background.</td>
<td>Year One enrolment is limited to approximately 850 students. Approximately 85% of these places are filled by Ontario Secondary School students. In recent years, most students admitted have had averages of 75% or better. However, a number of students with lower averages are admitted when other evidence indicates extensive involvement in extracurricular activities and an aptitude and interest in Engineering.</td>
</tr>
<tr>
<td>Civil - WC</td>
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<tr>
<td>Computer - WWJ</td>
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<tr>
<td>Electrical - WWF</td>
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<tr>
<td>Mechanical - WWH</td>
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<tr>
<td>Systems Design - WD</td>
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<tr>
<td><strong>Environmental Studies</strong></td>
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<tr>
<td>Architecture (pre-professional program)</td>
<td>Six Grade 13 or Ontario Academic Course credits including Relations &amp; Functions, Calculus, Physics, English (Français).</td>
<td>Applicants should take at least one Grade 12 or university-entrance level Science. A course in Relations &amp; Functions is recommended. Good English writing skills are required.</td>
<td>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 Grade 12 and university-entrance level academic records. Admission is based on the results of the interview (including a required portfolio), an English prose-writing exercise designed to test skills of analysis and expression, and on secondary school achievement. In recent years, most students admitted have had Grade 13 averages of 75% or better.</td>
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<tr>
<td>OUAC code: WR</td>
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<tr>
<td><strong>Environment and Resource Studies</strong></td>
<td>Six Grade 13 or Ontario Academic Course credits.</td>
<td>Applicants should take at least one Grade 12 or university-entrance level Science. A course in Relations &amp; Functions is recommended. Good English writing skills are required.</td>
<td>Applicants with an average of 70% or better are given first consideration.</td>
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<tr>
<td>OUAC code: WMK</td>
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<tr>
<td><strong>Geography</strong></td>
<td>Six Grade 13 or Ontario Academic Course credits.</td>
<td>Applicants should take university-entrance level Geography, English, and one of Algebra, Calculus, Relations &amp; Functions.</td>
<td>Applicants with an average of 70% or better are given first consideration.</td>
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<tr>
<td>OUAC code: WG</td>
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<tr>
<td><strong>Urban and Regional Planning</strong></td>
<td>Six Grade 13 or Ontario Academic Course credits.</td>
<td>Applicants should include one of university-entrance level Algebra, Calculus, Relations &amp; Functions. Of the three recommended Mathematics courses, Calculus has top priority. Good English writing skills are required.</td>
<td>Applicants with an average of 70% or better are given first consideration. Letter of reference and a Personal Information form are required. When necessary, selective interviewing may be part of the admission process.</td>
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<tr>
<td>OUAC code: WP</td>
<td></td>
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<tr>
<td><strong>Human Kinetics &amp; Leisure Studies</strong></td>
<td>Six Grade 13 or Ontario Academic Course credits.</td>
<td>Applicants to the General or Honours BA degree program should include English and History in their university-entrance level program.</td>
<td>Applicants living within a reasonable commuting distance of Waterloo should arrange an interview with the Undergraduate Officer regarding admission to the program. Applicants unable to travel to Waterloo should contact the Undergraduate Officer to make other arrangements. Auditions for advanced placement in studio courses are held at the start of classes.</td>
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<tr>
<td>Dance</td>
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<tr>
<td>OUAC code: WD</td>
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</tbody>
</table>
## Admissions

### Specific Faculty Program Recommendations and Requirements

<table>
<thead>
<tr>
<th>Faculty/Program</th>
<th>Required University-Entrance Subjects and Minimum Averages</th>
<th>Recommendations</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Health Studies</strong></td>
<td><strong>OUAC codes:</strong></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Regular - WF</td>
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<tr>
<td></td>
<td>Co-op - WW</td>
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<tr>
<td><strong>Kinesiology</strong></td>
<td><strong>OUAC codes:</strong></td>
<td></td>
<td><strong>The Kinesiology program includes required university courses in Biology, Calculus, Chemistry, Computer Science, Physics, Psychology and Sociology.</strong></td>
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<tr>
<td></td>
<td>Regular - WY</td>
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<td>Co-op - WL</td>
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<tr>
<td><strong>Recreation and Leisure Studies</strong></td>
<td><strong>OUAC codes:</strong></td>
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<td></td>
<td>Regular - WX</td>
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<tr>
<td></td>
<td>Co-op - WZ</td>
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<tr>
<td><strong>Independent Studies</strong></td>
<td><strong>OUAC code:</strong></td>
<td>Each applicant to Independent Studies is considered on the basis of a personal interview with a committee composed of students and staff. Those who show an aptitude for self-direction and independent study, and the ability to flourish in an unstructured academic setting will be given preference.</td>
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<td>WI</td>
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<tr>
<td><strong>Mathematics</strong></td>
<td><strong>OUAC codes:</strong></td>
<td></td>
<td><strong>The Faculty of Mathematics makes every effort to ensure that those students who are best prepared are admitted. It is recognized that school grades are the primary indicator of preparedness, and the majority of admitted students have averages of 70% or higher. The Admissions Committee also gives close attention to performance in the December Mathematics Contest, and involvement in extracurricular activities.</strong></td>
</tr>
<tr>
<td></td>
<td>Regular - WH</td>
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<td><strong>Any combination of these may considerably enhance an applicant's possibility of admission. Students not offered admission to the program of their choice are considered for all other Mathematics Programs.</strong></td>
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<tr>
<td></td>
<td>Co-op (C.A. Option) - WN</td>
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<td></td>
<td>Co-op (Including Computer Science) - WT</td>
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<td></td>
<td>Regular (Including Computer Science) - WM</td>
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<tr>
<td><strong>Science</strong></td>
<td><strong>OUAC codes for Science:</strong></td>
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<td></td>
<td>Applied Chemistry (Co-op) – WH</td>
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<td>Applied Physics (Co-op) – WY</td>
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<td>Biology (Co-op) – WDU</td>
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<td>Geophysics (Co-op) - WYW</td>
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<td></td>
<td>Optometry (Years 1-4) - WB</td>
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<td>(Application is made after completion of Year One Science.)</td>
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<tr>
<td><strong>Admissions</strong></td>
<td><strong>OUAC codes:</strong></td>
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<td></td>
<td>Regular - WZ</td>
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<tr>
<td></td>
<td>Co-op - WZZ</td>
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</tbody>
</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 3Gl 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 out 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.

   **Term starting** | **Last date for application**
   --- | ---
   May 1987 | March 1, 1987
   July 1987 | June 1, 1987
   *September 1987 | July 1, 1987
   January 1988 | November 1, 1987

   **Correspondence Program**
   Fall Term 1987 | August 7, 1987
   Winter Term 1988 | October 16, 1987
   Spring Term 1988 | February 12, 1988

   *Applications and all supporting documentation must be received no later than May 1, 1987 for all Year One limited-enrolment programs, with the following exceptions:

   1. Architecture requires that applications must be dated as received at the OUAC no later than March 15 and that supporting documents be received at the University no later than April 15.
   2. Optometry requires that applications must be received at the University 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 12, 1987 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 12, 1987 are encouraged to confirm as soon as possible, but are not required to respond before June 26, 1987.

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.
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:

A) NEWLY ADMITTED STUDENTS:
As soon as possible after academic admission. Information regarding preregistration is forwarded when the student is admitted.

B) RETURNING STUDENTS:
1. Co-operative Programs – During the preceding on-campus term.
2. Regular Programs – During March of the preceding academic year.

The above action will produce the "Student Schedule and Fee Statement."

Students are encouraged, where possible, to preregister and pay their fees by mail by sending a cheque or money order payable to the institution of their intended registration (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
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 4 on page 3.7).

Fees and Registration
Preregistration, Registration, Fees

A) CO-OPERATIVE PROGRAMS:
1. 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.

B) REGULAR PROGRAMS:
1. All Terms
   a) Architecture Year 1, 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.
   b) 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.

2. Summer Session (July-August)
   Students are assessed by course at the Unit Course Fee shown.

Payment
A) TIMING AND AMOUNTS DUE
   All fees are due and payable by the end of the registration period. See pages 7-10 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.

B) METHODS
1. By Mail
   The University encourages students to register by mail. Detailed instructions outlining the payment procedure will be included with the Fee Statement.

2. In Person
   For students who cannot register by mail, a registration period is held on campus at the beginning of each term. See pages 7-10 for dates.
C) GENERAL INFORMATION

1. Fees should be paid with cash, money order or cheque payable to "University of Waterloo."
2. 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.
3. Students who have received a "Notice of Assessment" under the Ontario Student Assistance Program may arrange payment of fees using this source of funds.

Apply for OSAP early (Allow 60 days processing time). OSAP funds not received by start of term cannot be used as a means to register.

4. The University will accept post-dated cheques as an arrangement for the payment of fees. Post-dated cheques can be dated up to, but not beyond, the date of the first day of registration for the terms as shown below:

<table>
<thead>
<tr>
<th>Term</th>
<th>First Day of Registration</th>
</tr>
</thead>
<tbody>
<tr>
<td>September 1987</td>
<td>8 September 1987</td>
</tr>
<tr>
<td>January 1988</td>
<td>4 January 1988</td>
</tr>
<tr>
<td>May 1988</td>
<td>2 May 1988</td>
</tr>
</tbody>
</table>

5. 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.

6. Canadians or Permanent Residents age 60 or over will be awarded a University bursary to cover tuition and related incidentals (correspondence tape deposits not included). Proof of eligibility for this bursary should be furnished to the appropriate Assistant Registrar at the time of preregistration.

7. 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.

8. Students who fail to fulfill fee payment arrangements will be assessed a 6% surcharge on the total fees outstanding plus 1½% per month service charge applied to the balance outstanding and calculated from the due date.

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

C) FEES AND REGISTRATION

Banking Information
Most major banks are near campus but it is suggested that students bring a certified cheque, draft or money order as their initial deposit. Fund transfers can take up to 2 weeks to complete, during which time the student does not have access to the funds.

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 7-10 for dates when late fees start.

Students will not be allowed to register after the dates shown below:

<table>
<thead>
<tr>
<th>Term Starting</th>
<th>Last Date to Register</th>
</tr>
</thead>
<tbody>
<tr>
<td>May 1987</td>
<td>30 June 1987</td>
</tr>
<tr>
<td>July 1987</td>
<td>31 July 1987</td>
</tr>
<tr>
<td>September 1987</td>
<td>30 October 1987</td>
</tr>
<tr>
<td>January 1988</td>
<td>29 January 1988</td>
</tr>
<tr>
<td>May 1988</td>
<td>30 June 1988</td>
</tr>
</tbody>
</table>

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:

a) Students withdrawing before the start of classes will receive a full refund.
b) Students withdrawing in the first 3 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.
c) Students withdrawing during weeks 4 to 7 of a term (second week of Summer Session) will receive a refund of 50%.
d) Refunds are not provided to students after week 7 of a term (week 3 of Summer Session).

The specific withdrawal dates are included in the registration information package sent to students each term.
e) Requests for refunds of refundable incidental fees must be addressed to the organization concerned. Such refunds are available for only 3 weeks after the start of classes.

f) The Intercollegiate Athletic Fee, the Co-op Fee and the Computer Fees are refundable upon withdrawal on the same basis as tuition fees.

g) 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.

h) The Recreational Facility Fee and Federation Hall Fee are not refundable.

i) 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.

**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 three of Summer session).
PRELIMINARY Schedule of Fees – Undergraduate Programs – Tuition & Incidental Fees for all Years
- Canadian Citizens and Permanent Residents

These fees have not been approved by the Board of Governors. They are estimated based on information available in late January 1987. At that time, the Ministry of Colleges and Universities had not yet decided on the admissibility of certain compulsory ancillary fees nor on the levels of tuition fees for 1987-88. 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 3:8 for fee information.

<table>
<thead>
<tr>
<th>Faculty</th>
<th>Basic Term Fee $</th>
<th>Co-op Fee $</th>
<th>Incidental Fee $</th>
<th>Subtotal $</th>
<th>Possible Total Fees $</th>
<th>Unit Course Fee $</th>
</tr>
</thead>
<tbody>
<tr>
<td>Architecture</td>
<td>746.00</td>
<td>250.00</td>
<td>84.23</td>
<td>830.23</td>
<td>18.00</td>
<td>848.23</td>
</tr>
<tr>
<td>Arts</td>
<td>687.00</td>
<td>250.00</td>
<td>97.04</td>
<td>1093.04</td>
<td>18.00</td>
<td>1111.04</td>
</tr>
<tr>
<td>Engineering</td>
<td>746.00</td>
<td>250.00</td>
<td>103.54</td>
<td>1089.54</td>
<td>45.00</td>
<td>1134.54</td>
</tr>
<tr>
<td>Environmental Studies</td>
<td>687.00</td>
<td>250.00</td>
<td>97.04</td>
<td>1034.04</td>
<td>17.00</td>
<td>1051.04</td>
</tr>
<tr>
<td>Human Kinetics and Leisure Studies</td>
<td>687.00</td>
<td>250.00</td>
<td>95.04</td>
<td>1032.04</td>
<td>17.00</td>
<td>1049.04</td>
</tr>
<tr>
<td>Independent Studies</td>
<td>687.00</td>
<td>79.23</td>
<td>766.23</td>
<td>766.23</td>
<td>153.00</td>
<td></td>
</tr>
<tr>
<td>Mathematics</td>
<td>687.00</td>
<td>250.00</td>
<td>97.04</td>
<td>1034.04</td>
<td>45.00</td>
<td>1079.04</td>
</tr>
<tr>
<td>Science</td>
<td>687.00</td>
<td>250.00</td>
<td>99.04</td>
<td>1036.04</td>
<td>18.00</td>
<td>1054.04</td>
</tr>
<tr>
<td>Summer Session</td>
<td>Half Course (0.5 credits)</td>
<td>Full Course (1.0 credits)</td>
<td>153.00</td>
<td>306.00</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*The Professionally Accredited Stream (PAS) of this program requires an additional internship fee of $150.00 per term.*

Computer Enhancement Fee for Part-time students (1987/88 levels):
- Arts Accountancy Studies $17.50
- Arts Other $12.50
- Engineering $15.00
- Environmental Studies $15.00
- Human Kinetics and Leisure Studies $15.00
- Mathematics $15.00
- Science $15.00

Schedule of fees effective May 1, 1987.
Fees for Foreign Students with Student Authorizations (see also Note 4)

These fees have not been approved by the Board of Governors. They are estimated based on information available in late January 1987. At that time, the Ministry of Colleges and Universities had not yet decided on the admissibility of certain compulsory ancillary fees nor on the levels of tuition fees for 1987-88. A schedule of fees approved by the Board of Governors will be included with student registration information.

1. For an undergraduate student on Student Authorization who was registered in a degree program for the first time in a term beginning September 1982 or January 1983 or one who had not by September 1982 successfully completed in his or her program, work equivalent to at least the normal load for a term of a full-time student in that program:
   Regular program fees are $2530.50 per term plus the applicable computer enhancement fees and incidental fees as shown below. The Unit Course Fee is $450.70 per Term Course.

2. For an undergraduate student on Student Authorization who was registered for the first time in a term beginning May 1983 or later:
   a) Registration in an undergraduate program* in Architecture, Engineering, or Optometry:
      Regular program fees are $4224.00 per term plus the applicable computer enhancement fees and incidental fees as shown below. The Unit Course Fee is $844.80 per Term Course.
   b) Registration in any other undergraduate program.*
      Regular program fees are $2591.50 per term plus the applicable computer enhancement fees and incidental fees as shown below. The Unit Course Fee is $518.30 per Term Course.

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

Incidental Fees

The following incidental fees are compulsory:

<table>
<thead>
<tr>
<th>Service</th>
<th>Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercollegiate Athletics</td>
<td>$22.84</td>
</tr>
<tr>
<td>Health Insurance</td>
<td></td>
</tr>
<tr>
<td>(See Note 5)</td>
<td></td>
</tr>
<tr>
<td>- Regular</td>
<td>$14.64</td>
</tr>
<tr>
<td>- Co-op</td>
<td>$27.45</td>
</tr>
<tr>
<td>Recreational Facilities</td>
<td>$10.00</td>
</tr>
<tr>
<td>(See Note 6)</td>
<td></td>
</tr>
<tr>
<td>Federation Hall</td>
<td>$ 7.50</td>
</tr>
<tr>
<td>(See Note 7)</td>
<td></td>
</tr>
<tr>
<td>Photo I.D. Cards</td>
<td></td>
</tr>
<tr>
<td>(See Note 8)</td>
<td></td>
</tr>
</tbody>
</table>

Fees and Registration

Schedule of Fees

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:

<table>
<thead>
<tr>
<th>Service</th>
<th>Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Federation of Students</td>
<td>$14.25</td>
</tr>
<tr>
<td>(See Note 9)</td>
<td></td>
</tr>
<tr>
<td>Student Society (See Note 10)</td>
<td>$ 5.00</td>
</tr>
<tr>
<td>- Architecture</td>
<td>$ 5.00</td>
</tr>
<tr>
<td>- Arts</td>
<td>$ 8.50</td>
</tr>
<tr>
<td>- Environmental Studies</td>
<td>$ 5.00</td>
</tr>
<tr>
<td>- Human Kinetics and Leisure Studies</td>
<td>$ 3.00</td>
</tr>
<tr>
<td>- Independent Studies</td>
<td>$ 3.00</td>
</tr>
<tr>
<td>- Mathematics</td>
<td>$ 5.00</td>
</tr>
<tr>
<td>- Optometry</td>
<td>$ 4.00</td>
</tr>
<tr>
<td>- Science</td>
<td>$ 4.00</td>
</tr>
</tbody>
</table>

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:

<table>
<thead>
<tr>
<th>Service</th>
<th>Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>WPIRG (See Note 11)</td>
<td>$ 3.00</td>
</tr>
<tr>
<td>Sandford Fleming Foundation</td>
<td>$ 3.00</td>
</tr>
<tr>
<td>(See Note 12)</td>
<td></td>
</tr>
<tr>
<td>Radio Waterloo (See Note 13)</td>
<td>$ 4.00</td>
</tr>
<tr>
<td>Imprint (See Note 14)</td>
<td>$ 3.00</td>
</tr>
<tr>
<td>Science Foundation (See Note 15)</td>
<td>$ 3.00</td>
</tr>
</tbody>
</table>

Note 1 - Term

Term refers to a particular 4-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 Coordination, the Registrar’s Office, and other departments which serve the students. These costs are not provided for in the operating grants received from Government.
To all students beginning a program on or after 1 programs in which students pay fees.

In 1987-88 the Co-op service fee represents approximately 50% of the extraordinary cost of supporting the Co-operative program. To assist in planning for their educational expenses, students registering in Co-operative programs are advised that this fee will be increased over a three-year period to a level which will recover about 60% of these costs.

Estimated Co-operative Program Fee:

Effective May 1, 1987 $250.00 per term
Effective May 1, 1988 $325.00 per term
Effective May 1, 1989 $425.00 per term

Students registered in Co-operative programs normally are not allowed to withdraw from them and register in Regular programs. However, in the event that such a change of registration is approved, the University reserves the right to collect from those students who have not yet paid Co-op fees in proportion to the time spent in the Co-operative program.

Note 3 - Unit Course Fee (1987-88)
The fee assessed at $153.00 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 4 - 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 1 January 1977. The higher fees apply to all students beginning a program on or after 1 January 1977, except for those who qualify for exemption under one of the following categories.

1. A citizen of Canada within the meaning of the Canadian 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 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 member of the staff of any such diplomat. consular officer. representative or official;
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 the Canadian International Development Agency (including the Commonwealth Scholarships and Fellowships), or by 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 provided he or she is studying in Canada under a cultural exchange agreement between the Government of Canada and the government of another country or a formal agreement between a provincially-assisted institution in Ontario and a post-secondary institution in another country, provided that under such an agreement, the number of places made available in Ontario universities, Ryerson or the Ontario College of Art normally equals the number of places made available to Ontario residents in the other country or institution as the case may be.
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.

Note 5 - Health Insurance
Effective 1 September 1978, a revised supplementary Student Health Insurance Plan was put into effect at the request of the student body. Student premiums are as shown in the Schedule of Fees. The premium and coverage may be waived if proof of equivalent or better insurance coverage is provided. Dependent (family) coverage may be obtained on request and by payment of a further $19.90 for a Regular student per term and $37.32 for a Co-operative student at each registration.
This plan does not include the premium or benefits of the Ontario Health Insurance Plan. It is the student's own responsibility to ensure that such personal coverage is obtained.
Further details are available from Health Services.

Note 6 - Recreational Facility
A non-refundable fee approved by student referendum for construction of the Columbia Ice Field (Ice Arena North Campus).

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

Note 8 - Photo I.D. Cards
All on-campus full-time and part-time undergraduate students will be assessed a one time only fee of $4.25 to cover the cost of issuance of individual photo I.D. cards. This fee is compulsory and non-refundable. See Note 17 re: replacement cost.

Note 9 - 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 7 to 10 of this Calendar.

Note 10 - 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 7 to 10 of this Calendar.

Note 11 - 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 7 to 10 of this Calendar.

Note 12 - Sandford Fleming Foundation (S.F.F.)
An organization dedicated to the development of cooperative 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 7 to 10 of this Calendar.

Note 13 - Radio Waterloo
The on-campus student radio station.
This fee is voluntary, refundable, and not a requirement for registration. Requests for refund 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 7 to 10 of this Calendar.

Note 14 - 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 7 to 10 of this Calendar.

Note 15 - 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 7 to 10 of this Calendar.

Note 16 - Computer Enhancement Fee
Non-refundable fee assessed to all on-campus students.

Note 17 - 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
Re-examination fee (Engineering only) $25.00
Returned Cheques – Handling charge (plus late registration penalty as applicable) $15.00
Duplicate Tax Receipt $ 5.00
Duplicate of Fee Statement Receipt $5.00
Replacement of lost or stolen student Photo Identification Card 10.00
Replacement of lost or stolen student Health Insurance Card $ 5.00
Transcript of Record
– $3.00 for first copy
– $1.50 for each additional copy ordered at the same time as the first copy.
Letter of Permission $20.00
To Whom It May Concern Letters
– $3.00 for first copy
– $ .50 for each additional copy ordered at the same time as the first 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 academic period 1 May 1987 to 30 April 1988 will be available after 1 March 1988.
- 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 1 March 1988.)
Scholarships and Prizes, Bursaries and Financial Aid
Scholarships and Prizes, Bursaries 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.

Regulations Governing University of Waterloo Undergraduate Scholarships

1. The first charge against any scholarship payment will be for tuition and fees.
2. If no qualified applicant is found for a particular award in any year, the University reserves the right to withhold the award.
3. 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.
4. If a student withdraws or otherwise fails to complete the term(s) covered by a scholarship, the scholarship may be pro-rated.

University of Waterloo Entrance Scholarships

The University awards a substantial number of entrance scholarships to entering students. With the exception of special awards for students from Waterloo County secondary schools, these scholarships are awarded on the basis of 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 awarding entrance scholarships in Chemistry, Engineering, Mathematics, and Physics as follows:

Scholarships and Prizes, Bursaries and Financial Aid

University of Waterloo Entrance Scholarships

Chemistry Scholarships
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 and are encouraged to write all three.

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

ARTS FACULTY SCHOLARSHIPS

The Faculty of Arts is offering several entrance scholarships in recognition of academic excellence. Entrance scholarships, awarded on the basis of secondary school performance, have values ranging from one-year $1100 awards to two-year $2100 awards of which $1200 is allocated for first year and an additional $900 for second year, if the student maintains an A average. The Faculty also offers numerous Arts Scholar Awards valued at $100 and one award of $500.

Federal-Provincial Conference Simulation Entrance Award
One award valued at $100 will be made annually by the Political Science Department to a student entering the first year of full-time studies at the University of Waterloo 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.

J. Sayer Minas Entrance Scholarship
The award, valued at $1500 in the first year and renewable at $1200 for three years, if the student maintains an A average, to a possible total value of $5100, is given to the most outstanding student entering first year in the Faculty of Arts.

Mary Rosenthal Entrance Scholarship
One scholarship, valued at $300 will be presented to a top student from Wellington County entering the Faculty of Arts.
Scholarships and Prizes, Bursaries and Financial Aid
University of Waterloo Entrance Scholarships

W.J. Schlatter Scholarship
This $500 scholarship will be 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 Accountancy Studies Admission Information Form.

ENGINEERING FACULTY ENTRANCE SCHOLARSHIPS
The Faculty of Engineering offers three types of scholarships: (1) a large number of one-term tuition awards (2) a small number of one or two year awards each with a total value of $1100 to $2500 (3) one or two awards valued at $2000 for Year One and renewable for Years Two, Three and Four each having a total value of $4200. A term average of 80% is required for renewal of entrance scholarships. Scholarships are awarded on the basis of Grade 13 average, the results of the CHEM 13 NEWS Competition, Sir Isaac Newton Physics Competition and Descartes Mathematics Competition, and information supplied on the Personal Information Form for Applicants. Students must write the Descartes Mathematics Competition and are encouraged to write all three of the Chemistry, Physics and Mathematics Competitions.

Alfred Armbrust Memorial Scholarship
This scholarship is awarded annually to an outstanding student entering the Faculty of Engineering.

Association of Professional Engineers Entrance Award
The Association of Professional Engineers of the Province of Ontario provides a $750 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 $1200 renewable for three years to a total value of $4800 if the student maintains a term average of 80%. The award will be 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 Engineering Entrance Award
One award of $500 will be given to an outstanding student entering the Faculty of Engineering from Annandale High School or Glendale High School, Tillsonburg, Ontario. Preference will be given to students entering Systems Design.

Sullivan Engineering Entrance Award
One award of $500 will be given to an outstanding student entering the Faculty of Engineering from Pauline Johnson Collegiate and Vocational School, Brantford, Ontario. Preference will be given to students entering Chemical Engineering.

ENVIRONMENTAL STUDIES FACULTY SCHOLARSHIPS
Awards are available in varying amounts for one year. All students with an Ontario Secondary School average of 85% 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.

HUMAN KINETICS AND LEISURE STUDIES FACULTY SCHOLARSHIPS
Awards are available in varying amounts for one year. All students with an Ontario Secondary School average of 85% or better are considered.

MATHEMATICS FACULTY SCHOLARSHIPS
René Descartes Scholarships, Fellowships and Bursaries
Entrance awards in varying amounts are offered through the Faculty of Mathematics to first-year students enrolled in that Faculty and showing the University of Waterloo as their first choice on the application for admission to the University. In order to be eligible, a student must write the Descartes Mathematics Competi-
Scholarships and Prizes, Bursaries and Financial Aid
University of Waterloo Entrance Scholarships
University of Waterloo Upper Year Scholarships

UNIVERSITY OF WATERLOO - WATERLOO COUNTY ENTRANCE SCHOLARSHIPS
One Entrance Scholarship per school is awarded to an outstanding student entering the University from a Waterloo County Secondary School. 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 Regional Municipality of Waterloo. The awards are made in conjunction with Waterloo County Entrance Scholarships.

Gladys and Norman RALTER Memorial Scholarships
A number of entrance scholarships are awarded to the top eligible students graduating from Waterloo County secondary schools. 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 Waterloo County secondary schools. They are awarded in conjunction with Waterloo County Entrance Scholarships.

University of Waterloo Upper Year Scholarships

ARTS FACULTY SCHOLARSHIPS
Upper year scholarships valued at $500 are awarded on the basis of the previous year’s standing. Part-time students may be eligible for awards of $100 after completing at least 10 half credits at UW.
ENGINEERING FACULTY SCHOLARSHIPS

Faculty of Engineering Upper Year Scholarships
Awards valued at $400 are presented to the top student in each class based on performance in terms 1B to 4A.

Undergraduate Research Assistantships
These awards are valued at $800 per term and provide an opportunity for undergraduates to participate in original Engineering research. These are available to first class honours students in the 2A - 4B terms. To be eligible, a student must apply at the beginning of the term and show an interest in a particular field. The Assistantship is made available through the professor pursuing research in that area.

ENVIRONMENTAL STUDIES FACULTY AND STAFF SCHOLARSHIPS
A limited number of upper year scholarships will be made available to students enrolled in the Faculty of Environmental Studies. The amounts of each award will vary and in general the scholarships are awarded on the basis of academic achievement in prior years.

Architecture Fourth Year Entry Prize
This $500 award is given to the student returning to fourth year Architecture with the best overall performance in design upon completion of the Bachelor of Environmental Studies degree.

HUMAN KINETICS AND LEISURE STUDIES FACULTY AND STAFF SCHOLARSHIPS
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 Human Kinetics and Leisure Studies
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.

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

MATHEMATICS FACULTY SCHOLARSHIPS

Scholarships and Prizes, Bursaries and Financial Aid
University of Waterloo Upper Year Scholarships

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.

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 extracurricular activities. The medal is in honour of Kenneth D. Fryer, a professor of Mathematics since 1969. 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.

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 90% or A- standing.

SCIENCE FACULTY AND STAFF SCHOLARSHIPS
A limited number of scholarships may be awarded to students in General 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 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).

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

Aetna Canada Award
Two scholarships of $500 each will be awarded to the outstanding students in the second year of the Actuarial Science program. Applications should be submitted during the 18 term.

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 will be awarded 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 will be 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.

Scholarships and Prizes, Bursaries and Financial Aid
University of Waterloo Upper Year Scholarships
Undergraduate Scholarships

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.

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 three annual scholarships of $375, one to the student in each of the first, second and third 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 will be 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, 314, 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 $1000. 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. Beatle Medal**
The bequest of T.T. Beatle 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.

**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 3B term.

**J.P. Bickell Foundation 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.

**British Columbia Optometric Association Scholarship**
The British Columbia Optometric Association presents a scholarship in the amount of $500 to a resident of British Columbia who is admitted to the first professional year of the School of Optometry. This is awarded on the basis of academic achievement.

**Canada Packers Inc. Post Secondary Awards**
A Canada Packers Inc. - Research And Development Division Award of $500 is available to an undergraduate student in Chemical Engineering who has a high academic standing during the first and second year and is continuing in that program. Positive evidence of leadership and contribution to university and/or community life is also given strong consideration. Applications should be submitted during the 2B term.

A Canada Packers Inc. - Edible Oils and Dairy Division Award of $750 is available to an undergraduate student in Chemistry Co-op Option who has high academic standing during the first and second year and is continuing in the program. Positive evidence of leadership and contribution to university and/or community life is also given strong consideration. Applications should be submitted during the 2B term.

**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 will be 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 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 will be 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.

All of the above prizes are made available through contributions of the following Canadian Suppliers and Laboratories:

- Alden Optical Laboratories, Fort Erie, Ont.
- Canadian Optical Supply Co., Montreal, Que.
- Hydron Canada Ltd., Etobicoke, Ont.
- KDS Optical Company Limited, Toronto, Ont.
- N & N Optical Ltd., Mississauga, Ont.
- Plastic Contact Lens Co. Ltd., Toronto, Ont.
- Professional Optical Co., Ltd., Willowdale, Ont.
- Union Optics Corp. of Canada, Scarborough, Ont.

Carousel Dance Centre Entrance Award

The Carousel Dance Centre has an award fund of $1000 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.

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

An award of $1500 will be given to two or three final-year Optometry students who have achieved excellence in their special studies.

Certified General Accountants Association of Ontario Award for Excellence

An annual award of $1000 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 will be made to an outstanding graduating student who has displayed achievement in accounting. Applications should be submitted during fourth year.

Morgan Champness Memorial Award

Two awards of $75 each will be 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 $1500 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 will be awarded to the fourth-year student with the highest academic standing in the Electrical Engineering Communications Option.

Chemical Institute of Canada Prize

Two awards, one each to a Chemistry and a Chemical Engineering student, are made annually by the Institute. The awards, consisting of an engraved medal and a Certificate of Merit, are given to the student with the highest academic standing in the penultimate year of either course.

Chevron Canada Resources Limited Scholarship

Two awards of $1000 will be awarded to outstanding undergraduate students entering the final year in Engineering. One award of $1000 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.
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 $75 is awarded annually to an outstanding Correspondence student who is majoring in Classical Studies.

Classical Studies Essay Prize
The Classical Studies Essay Prize of $75 will be 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 academic year.

Classical Studies Scholarship
An award of up to $500 will be 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.

Crowntek Computer Science Scholarship
The scholarship, valued at $350, is awarded to the outstanding student entering fourth-year Computer Science (Co-op) who has demonstrated both academic excellence and outstanding leadership. Applications should be submitted during the 3B term.

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

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.

John Deere Limited Scholarship
An award valued at $1000 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. DeLeuw Transportation Scholarship
The DeLeuw 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 of $500 and will be given to the student showing high academic achievement, good character, and financial need. Applications should be submitted during the 4B term.

Digital Equipment of Canada Ltd. Award of Merit
A certificate and a cash award of $250 will be presented each year to an outstanding third-year student in Computer Science or Computer Engineering.

Dow Chemical of Canada Scholarship in Chemical Engineering
$900 is awarded to the student and a grant-in-aid of $350 to the Department. The scholarship is awarded annually to a student, not otherwise holding a scholarship, entering final year of an undergraduate program in Chemical Engineering who has a sincere interest in the chemical industry and who has demonstrated leadership in extra-curricular activities. Applications should be submitted during the 3B term.

George Dufault Medal for Excellence in Communication
The George Dufault Medal is awarded annually to the graduating student in the 4B term in Engineering who has demonstrated excellence in communication ability through the submission of outstanding work-term reports and the oral presentation of one of these reports in a competition held during the last (4B) term of the academic program. The award was established by the family of the late George Dufault in recognition of his contribution to the University as its first co-ordinator and first head of the Department of Co-ordination, now the Department of Co-operative Education and Career Services, and later as a lecturer in Physics and a professor of Electrical Engineering.

Randy Duxbury Memorial Award
The $500 award is allocated to a student in third-year Chemical Engineering who has a good academic record, has demonstrated a strong interest in extra-curricular activities and athletics and has evidence of leadership qualities. Applications should be submitted during the 3B term.

J.W. Dyck Honours Scholarship
An annual award of approximately $1000 will be provided to a student entering the second year of a German and/or Russian program. Interested students should apply to the Department of Germanic and Slavic
Scholarships and Prizes, Bursaries and Financial Aid
Undergraduate Scholarships

Languages and Literature during the Winter term of their first year.

**Eaton Foundation Scholarship**
Two scholarships of $2500 each will be awarded to two students entering fourth-year Computer Science Information Systems Option. The decision will be based on performance in specific information Systems Option courses along with work-term performances and work-term report evaluations. Applications should be submitted during the 3B term.

**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 $1500 will be 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.

**Energy + Design Award**
Fibreglass Canada and Professor Joe Somfay of the School of Architecture have made available an annual award valued at $200. The award will be presented to an Architecture student who submits the best energy related design. Students should submit their designs to the Chairman of the Awards Committee.

**English Language Proficiency Prize**
Several prizes of $100 each are awarded to students from all Faculties 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 will be awarded, one to the student achieving the highest mark in Accounting 441 (Accounting Information Systems) and one to the student achieving the highest mark in Computer Science 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.

**L. Fejer Award in Mathematics**
The scholarship will not exceed $3000 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.

**Scott Kelsey Fevreau Memorial Award**
A $630 award has been established in memory of Scott Kelsey Fevreau, 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.

**First Year Engineering Prizes**
Prizes of approximately $100 will be 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 chairman, Dr. John Fisher. The award, consisting of a citation and a honorarium of $100, 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 Chairman of the Sandford Fleming Foundation.
Scholarships and Prizes, Bursaries and Financial Aid
Undergraduate Scholarships

Sandford Fleming Debate Awards
The Sandford Fleming Foundation has established the Sandford Fleming Debates 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 Engineering programs: Chemical, Civil, Electrical, Mechanical, Systems Design Engineering 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 Engineering programs: Chemical, Civil, Electrical, Mechanical and Systems Design Engineering. 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.

Department of French Prize
A prize of $100 will be 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 $1000 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.

General Motors of Canada Limited Co-operative Student Awards
Up to five new awards per term will be offered to cover tuition and an allowance for books and materials. All Co-op students who have successfully completed at least three school terms and two work terms with GM are eligible to apply. Selection of recipients will be based on work-term performance evaluations, university marks, work-report evaluations, interest in continuing Co-op employment with GM and in becoming a permanent GM employee, extra-curricular activities, and an interview. Interested Co-op students should apply to the Co-operative Education Co-ordinator at any GM plant location during their second work term at GM.

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.

Graham Goddard Anthropology Medal
A silver medal will be awarded annually to a third or fourth-year Anthropology Major or Honours student with an interest in the Native Peoples of North America (including any aspect of their society and culture - prehistoric, historic, or contemporary) demonstrated either through course selection or essay writing. No application necessary.

Grand Valley Consecration Foundation Scholarship
A $1200 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.

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 training function in the University or the community. Letters of recommendation and the application should be forwarded to the Student Awards Office by October 15.

Percy Hermant Centennial Bursary Scholarships
These awards 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 $2000, 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 Optometric Associations are consulted in awarding these Bursary scholarships. Applications should be submitted to the Student Awards Office before September 15 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**
Two awards of calculators will be made annually. The calculators will be awarded to the top student in the final year of the Electrical Engineering and Computer Science programs.

**Lynn Holmes Memorial Award**
An award of $450 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.

**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 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.

**Scholarships and Prizes, Bursaries and Financial Aid**
**Undergraduate Scholarships**

**K-W Optical Company Limited 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 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 Biology and Chemistry and one prize to a student in Co-op Honours Biology.

**Jeanne La France Scholarship**
The Jeanne La France Scholarship is awarded in honour of Professor Jeanne La 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**
District #3 of the Ontario Association of Optometrists present 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 prize was established to recognize the contribution of Prof. 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.

**RJR-Macdonald Accounting Excellence Scholarship**
This scholarship, valued at $4000, is awarded annually to the student pursuing the Masters of Accounting program who is judged to be the outstanding member of the graduating class in Honours Accountancy Studies, based on excellence in academic performance and demonstrated leadership. The scholarship is paid to the student in two equal instalments during the first two terms of the Master of Accounting program.
MacDonald Dettwiler and Associates Ltd. Scholarship
Two awards of $1000 each to students in Computer Science and Electrical Engineering who are entering fourth year and who have displayed high academic standing and leadership abilities through involvement in department or student society activities. Applications should be submitted during the 3B term.

Donald C. MacKenzie Prize in Classical Languages
The Classical Studies Prize of $75 will be awarded annually to the student who attains the highest mark in either Latin 203/204 or Greek 100. To qualify for the prize the student must enrol in a further Latin or Greek course at the 200 level.

Douglas T. MacPherson Scholarship
AOCCO Limited/Primitee presents annually the Douglas T. MacPherson Scholarship to a Canadian student admitted to the first professional year of the School of Optometry. This $1000 award is made on the basis of academic achievement.

Manitoba Optometric Society Scholarship
The Manitoba Optometric Society presents a scholarship in the amount of $300 to a resident of Manitoba who is entering the first professional year of Optometry.

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 Bio/Chemistry) program with the highest overall average in third and fourth year courses.

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.

Burton McKay Memorial Scholarship
The British Columbia Optometric Association presents a scholarship in the amount of $500 to a resident of British Columbia who is accepted to the first professional year of the School of Optometry. This is awarded on the basis of academic achievement.

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 Fund
Two awards are given to the third or fourth-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 $350 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
The book prize was established in 1968 by relatives and friends in memory of the late Jerome Thomas Miller, B.Sc.,M.Sc. (1966) - Honours Chemistry and Physics. The book is to be awarded each year, on the basis of marks, to the student in third year of a program which combines studies in Chemistry and Physics.

W.I. Miller Scholarship
The W.I. Miller scholarship, worth $1500, 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.

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

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.
Scholarships and Prizes, Bursaries
and Financial Aid
Undergraduate Scholarships

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 $500 is provided by the Ontario Industrial Roofing Contractors Association annually. This is awarded to the winner of an architectural competition 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 $1000 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 $1000 is based on studio performance in third year and overall performance up to third year.

Ontario Hydro Electrical Engineering Award
An annual award of $1000 will be made to a student entering fourth-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 3B term.

Ontario Rubber Group/Rubber Chemistry Division, CIC Award
The Ontario Rubber Group and the Rubber Chemistry Division of the Chemical Institute of Canada have made available two $300 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.

Pennsylvania German Folklore Society Prize
An annual prize of $150 is awarded for the best essay submitted on any topic related to the history, culture or language of the Pennsylvania German people of Ontario. Submissions should be made by March 15, directly to the Department of Germanic and Slavic Languages and Literatures.

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 Optometry 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
It is awarded annually to a deserving student from Brant County who has an excellent academic record in a program in Environmental Studies, preferably entering second year.

Procter & Gamble Award of Excellence
Three annual awards of $1000 each are available to third-year Regular or 3B students in all Faculties who demonstrate academic excellence in their area of study, and have an impressive record of accomplishment and leadership in extra-curricular activities. Applications should be submitted in either 3A or the Winter term of third year.

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
One award valued at $100 will be presented to a third-year Recreation 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.
Scholarships and Prizes, Bursaries and Financial Aid
Undergraduate Scholarships

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, B.E.S. '71 (Geography). The book is to be 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.

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 award 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
- Nicola Duthie
- Anne Fredtkou
- Roman Guzowsky
- David Lamb
- Wade Mesher
- Mary R. Mitchell
- E.J. (Ted) Mulrooney
- Robert G. Somerville

Smale Fellowship
The award of $600 is based on work in the fourth year (BArch) program; leadership ability and academic and design excellence.

Society of Chemical Industry Award
An engraved plaque is awarded by the Society to the student with the highest standing in the final year of Chemistry.

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.

Stearns-Catalytic Limited Scholarship
The Stearns-Catalytic Limited scholarship of $1000 is offered annually to a student enrolled in an Engineering program. Applicants must have a minimum average of 80%. They must be entering their second or third year of study and have career objectives applicable to the engineering/construction industry. The recipient will be selected on the basis of academic performance, career goals, demonstrated managerial ability and a personal interview with representatives of the company. Applications should be submitted in January or September.

H.A. Stein Scholarship
A $500 scholarship will be 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.

Sun Life of Canada Award
This $500 award will be 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 will be 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.

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 Optometry (Optometry 242, 252, etc.).

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 Association Gold Medals
The University of Waterloo Alumni Association is providing 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.

Michael Wright Memorial Scholarship
$300 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 will be 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.

Work-Term Report Awards
All of the following are awards for work-term reports judged best for clarity, grammar and other communication skills. The technical content of the report is important but not a qualifying requirement. 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.

Scholarships and Prizes, Bursaries and Financial Aid
Undergraduate Scholarships
Work-Term Report Awards

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.

Canadian Information Processing Society Awards - Grand Valley Section
Three awards of $100 each to second, third or fourth year Computer Science students.

Control Data Canada, Ltd. Work-Term Report Award
Three awards of $100 each to second, third or fourth year Computer Science students.

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

Dofasco Awards
Three awards of $100 each to Civil, Electrical, Geological and Mechanical Engineering students following their first work term.

George J. Dufault Awards
The George Dufault Awards arise from a fund established by the Sanford 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.

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

Sanford 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.
General Foods Limited Work-Term Report Award
Three awards of $100 each to second, third or fourth year Biochemistry students.

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 to second, third or fourth year Systems Design students.

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

Kerr Addison Mines Limited 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 to second, third or fourth year Biology students.

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

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

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 to second, third or fourth year Electrical or Computer Engineering, Systems Design Engineering and Computer Science/Information Systems Option students.

Scholarships and Prizes, Bursaries
and Financial Aid
Work-Term Report Awards
Bursaries

Nova, An Alberta Corporation Work-Term Report Award
Three awards of $100 to second, third or fourth year Co-op Geography students.

Polysar Awards
Two awards of $100 to Chemical Engineering students following their first work term.

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 Mathematics/Chartered Accountancy Option and/or Arts Accountancy Studies students.

Xerox Research Centre of Canada Limited Awards
Three awards of $100 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 with Student Authorizations who have not been in Canada for more than one year will not normally be considered. Students in a Regular program should apply by January 30th. Co-op students may apply only in their B term. All bursaries are applied for on a common University of Waterloo application form, available from the Student Awards Office, unless otherwise stipulated.

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 will be given to mature individuals who were forced to interrupt their University education due to financial difficulties or family obligations and are now experiencing financial hardship re-entering the academic world. Mature students experiencing financial difficulties should write to the Student Awards Office 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 bonafide 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.

Bechtel Foundation of Canada Limited Bursary
Bechtel Canada Limited has made available six bursaries, each in the amount of $500 to be awarded to six students entering second-year Engineering at the University of Waterloo. Each award will be disbursed in a manner that shall not serve to reduce the amount of any federal or provincial loan and/or grant to which any recipient may otherwise be eligible. Financial need and scholastic standing shall be criteria employed in determining award winners.

J.P. Bickell Foundation 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 Student Bursary
This $200 bursary donated by the Biology Undergraduate Society, is available to any undergraduate student registered in the Biology Department.

Birks Family Foundation Bursary
Bursaries are made available by the Foundation to deserving undergraduates.

Campus Centre Board Bursary
Students encountering financial difficulties should arrange to speak with the Student Awards Officer regarding assistance from this source.

Canadian Federation of University Women – Kitchener-Waterloo Bursaries
A limited Bursary Fund has been established for mature women students studying on a part-time basis. Candidates must be pre-registered or registered in a degree program, have completed at least two half credits and are working toward an undergraduate degree through part-time studies. An application form as well as an explanation regarding financial need must be submitted to the Student Awards Office prior to the month in which the study period begins.

Canadian Federation of University Women – Kitchener-Waterloo Part-Time Bursaries
One bursary of $200 will be awarded annually to a Geography or Urban and Regional Planning student whose permanent address is within a member municipality of the Credit Valley Conservation Authority.

Shelley Ellison Memorial Award
An award will be made to a third-year Planning student who has maintained a B average, has financial need and can document a commitment to Professional Planning and to the spirit of friendship within the School. Preference will be given to female applicants. Special application required.

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.

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.

J.G. Haegy Alumni Bursary
In honour of J.G. Haegy, 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 will be 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, offered annually, will be for an amount of $200 and will be 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.

**I.O.D.E. – Tommy Atkins Chapter Bursary**

A bursary valued at $150 is awarded annually to a needy full-time undergraduate whose permanent residence is in Kitchener or Waterloo.

**Interprovincial Pipe Line Company Bursary**

The Company provides $2000 for bursaries for students beyond the first year who are in need of financial assistance. At least 50% of the funds granted must go to students in Engineering. Preference will also be given to students whose normal residence is 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 $350 may be awarded annually to a full-time student from the Kitchener and Waterloo area registered in an Arts or Music program.

**Litton Systems Bursary**

Two bursaries, valued at $250 each, are offered annually by Litton Systems (Canada) Limited to students in the Faculty of Engineering, with preference being given to those in the electronic or electromechanical fields.

**Hildegard Marsden Bursary Fund**

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

Scholarships and Prizes, Bursaries, and Financial Aid

**The Minnesota Mining and Manufacturing of Canada Limited Bursaries**

Three bursaries valued at $500 each, are awarded to students in either business, science or computer science related fields.

**Mike Moser Bursary Fund**

Bursaries will be awarded to deserving third and fourth year students who have financial need, an exemplary 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 Human Kinetics and Leisure Studies. Special application required. Application deadline is November 1.

**Natural Log Bursary**

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

**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 students entering second-year Computer Science at the University of Waterloo. The awards are presented on the basis of financial need and academic standing. Applications should be submitted during the 1B term.

**Ontario Credit Union Charitable Foundation Bursary**

One $250 bursary will be awarded annually to a second, third, or fourth year student in Business Management courses in Accounting, Economics or Management Studies.

**Phillips Cables Limited Bursary**

One bursary of $625 will be awarded to a Computer Science student who has financial need and satisfactory scholastic proficiency for the previous year of studies.

**A.F. (Tony) Pickard Memorial Award**

An award has been established in memory of A.F. (Tony) Pickard, former research co-ordinator, Applied Analysis and Computer Science, at the University of Waterloo. The amount of the award will vary from year to year depending upon the capital investment income. 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 will be 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.

Rockwell International of Canada Limited, Collins Canada Division Bursary
Bursaries totalling $500 will be awarded to deserving undergraduates in Electrical Engineering. Applications should be made to the Awards Officer by the end of the first month of the term. Preference will be given to students in third or fourth year.

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

Alan W. Shattuck Memorial Bursaries
Normally two bursaries of $400 to $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.

University of Waterloo Bursaries
The University has established a bursary fund to assist students who have a proven financial need. Bursaries normally valued at $200 each will be 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 will be awarded to full-time undergraduate students in any faculty who are in need of financial assistance.

Scholarships and Prizes, Bursaries and Financial Aid
Bursaries
University Loan Funds

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 standing and must demonstrate adequate repayment terms. 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 Accounting 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.

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.

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.

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 H.K.L.S. 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 awarded to any female student in H.K.L.S. or female varsity athlete.

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

Engineering Society Student Loan Fund
This fund was established by the Faculty of Engineering. Loans up to $300 for a period of up to 90 days are intended for Engineering students who have been faced with unexpected expenses during their academic term.

Engineering Student Loan Fund
This fund was established by the Faculty of Engineering. Loans up to $300 for a period of up to 90 days are intended for Engineering students who have been faced with unexpected expenses during their academic term.

Environmenta| 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.

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.

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 Financial Aid 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.

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)

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. A personal interview is normally required.
5. The Ontario Work-Study Plan establishes a means whereby students can actively finance the cost of their education through part-time employment in and around the campus thus lessening their dependence on loan funding. Positions are posted outside the Student Awards Office.

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.

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
Department of Co-operative Education and Career Services

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

Program Administrators
D. J. Beaupre, BComm (Loyola), CA
T. H. Fitzgerald, BA (St. Lawrence)
W. B. Fuller, BA (Western Ontario)
J. W. Hoag, BArch (Toronto), FRAIC
R. A. Klawitter, BA (Western Ontario), CIM
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Co-ordinators, Co-operative Education
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W. G. Dailey, BArch (Liverpool)
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S. A. Feraday, BSc (Waterloo)
R. A. Grant, BSc (Queen’s), PEng
D. S. Harris, BEng (McGill), PEng
R. A. Harshaw, BASc (Waterloo), MBA (York), PEng
J. C. Henshaw, BSc (Toronto), PEng
J. W. Holland, BASc (Toronto), MBA (Western Ontario), PEng
E. M. Johnson, BA (Queen’s)
K. B. Kenning, BA (Wilfrid Laurier)
H. T. Lenton, FCIP
A. F. MacKinnon, BComm (Acadia)
J. Martin, BA (Windsor)
R. Mateyk, BASc (Toronto), PEng
P. J. Mazzei, BSc, MSc (Queen’s)
G. C. Murphy, PEng
R. Parker, BASc (Montreal), MBA (Toronto)
L. I. Pinaud, BSc, MSc (Queen’s)
M. A. Prins, BA (McMaster)
R. H. Roach, BSc (Waterloo)
J. R. Scooller, BSc, MBA (McMaster)
H. Scruaton, BA (Queen’s)
P. V. Solomonian, BMath (Waterloo), MBA (Wilfrid Laurier)
V. E. Sparrow, BA (Waterloo)
G. Subasic, BASc (Washington), PEng
D. N. Thomas, BSc (Guelph), MBA (McMaster)
C. J. Webster, BSc (Guelph)

Special Projects Co-ordinator
I.A. Lebold

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

Operations Co-ordinator
J. Pegg

Co-operative Education and Career Services

Placement Advisors
S. Hayes, BA (Western Ontario)
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 8, the other as Stream 4. Both groups receive the same total time on campus and at work. Stream 8 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 p. 53. 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.
## Work/Study Sequence

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

### Program (By Faculty)

#### Co-operative Education and Career Services

<table>
<thead>
<tr>
<th>Term</th>
<th>Stream 1</th>
<th>Stream 2</th>
<th>Stream 3</th>
<th>Stream 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sep-Oct</td>
<td>1A 1B * 2A 2B 3A 3B 4A 4B</td>
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<tr>
<td>Jan-Apr</td>
<td>1A 1B 2A 2B 3A 3B 4A 4B</td>
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<tr>
<td>May-Aug</td>
<td>1A 1B 2A 2B 3A 3B 4A 4B</td>
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<tr>
<td>Sep-Oct</td>
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<td>1A 1B 2A 2B 3A 3B 4A 4B</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

### Arts


### Engineering

- **Chemical, Civil, Computer**, Electrical, Mechanical Stream 8
- **Geological**
- **Systems Design**

### Environmental Studies

- **Architecture**
- **Environment and Resource Studies**

### Human Kinetics and Leisure Studies

- **Health Studies**, **Kinesiology**, **Recreation and Leisure Studies**

### Mathematics


### Applied Math, Applied Math with Computer Science, Applied Math with electives in Engineering, Pure Math, Pure Math with Computer Science or Statistics

### Math/Chartered Accountancy Computer Science/Chartered Accountancy

### Math/Management Accounting Computer Science/Management Accounting

### Math Teaching Option

### Science

- **Biology, Biochemistry, Applied Chemistry**
- **Stream 8**
- **Stream 4**
- **Applied Earth Sciences**
- **Applied Physics**
- **Stream 4**
- **Psychology**

### Regular off term

- **2A 2B 3A 3B 4A 4B**

### Regular off term Reg

- **2A 2B 3A 3B 4A 4B**

### Teaching work term

- **2A 2B 3A 3B 4A 4B**

### Work term

- **2A 2B 3A 3B 4A 4B**

### Admission

- **April or May/Aug periods.**

### Although the Co-op program begins in 2A, admission is made to the program at the time of the initial application to the University.

- **Following the 4A academic term, students may take the 4B academic term or the subsequent work term in either Jan/Apr or May/Aug periods.**

* This 4-month term is spent at University of Western Ontario, Faculty of Education, London.

S Students seeking admission must normally have satisfactorily completed 2 work terms in another Co-op Math program.

* Teaching work term.

V Admission occurs by January for the 2B term.
Co-operative Education and Career Services
Seeking Employment and Employer Interviews

Work Terms

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. Non-compliance 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 resumes 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 Employers 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.

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".

Deleting 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 terms 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 on 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.

Dismissed 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 - refused 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 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 deleting 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 5:4 and 5:5. The Department of Co-ordination and Placement 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.

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 p. 5:4.

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.

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.

J. D. MacDonald (President)
Northern Telecom Canada Limited
R. G. Taylor (Past President)
Telepanel Inc.
F. G. Brown (Vice-President)
IBM Canada Limited
R. T. Mahler (Secretary)
Amdahl Limited
J. O. Miller (Public Relations Chairman)
Dow Chemical Canada Inc.
P. A. McLagan (Membership Chairman)
DMR Group Inc.
N. Best
Ministry of Citizenship & Culture
D. W. Brown
Air Canada
D. M. Caughey
CADENCE Computer Corporation
R. D. Colling
Petro-Canada Resources
G. E. Cooper
Noranda Exploration Company Limited (Retired)
S. H. Cornforth
Price Waterhouse
S. Gendron
Inco Metals Co.
Co-operative Education and Career Services
Career Services
Career Information Centre

Career Services

Program Administrator
T. H. Fitzgerald, BA (St. Lawrence)

Co-ordinator, Career Services
F. M. Ruszer, BA, MSc (Guelph)

Career Advisor
M. Bryan, BA (Waterloo)

Alumni Placement Advisor
D. Hudspeth

Students at all academic levels, Regular or Co-op, in all Faculties, are assisted in determining career paths and in obtaining employment upon graduation. Employment possibilities and organizations compatible with the individual student's needs and abilities are discussed during personal interviews with career advisors.

Group workshops for students are held on job search, interview techniques, as well as résumé and letter writing. Career talks that cover many areas of interest to students are held throughout the year. These talks are designed to provide students with current information on career opportunities and employment trends.

Each year, several hundred employers are invited to conduct on-campus interviews for all graduating students. Employers interested in hiring graduates interview students during a four-week period in January/February. Summer and part-time employment opportunities are also available for non Co-op students.

The Alumni Referral Service is offered year-round to alumni seeking short-term or permanent employment. Resumes are forwarded on behalf of alumni to employers who are seeking candidates for open positions in their organizations.

The Career Services offices are located on the first floor of Ira G. Needles Hall.

Career Information Centre

The Career Information Centre contains material which assists students in self-assessment and career choice, résumé and letter preparation, creative approaches to job searching and preparation for interviews. Employer information can be obtained from files and directories. Calendars and educational directories for Canada and abroad assist in exploring educational possibilities. The Centre also has material to assist in planning travel, study and work abroad and a section on self-employment and alternative, non-traditional careers. A bulletin board on the first floor of Needles Hall contains summer jobs from October to May and part-time jobs year round. Hours are from 8:30 a.m. to 4:30 p.m., Monday through Friday, Needles Hall, Rm. 1115.
The following is a list of employers who participated in Waterloo’s Co-operative programs in 1988. The list does not acknowledge the many individual departments within some of the organizations who participated.

Aart’s Hair & Fitness Studio
Abal Manufacturing
Abell Maco Ltd.
Abibiti Price Inc.
Accuflex Industrial Hose Ltd.
Accugraph Corporation
Acres International Limited
Actel Resources Inc.
Adamson Associates
Adcom Electronics
Addiction Research Foundation
Adelaide Club
Adnet Information Systems
Adult Occupational Centre
Adventure-a-Day-Camp Inc.
AEA Electronic Ltd.
AES Data Limited
Aetna Canada
Agnew Associates
Agriculture Canada
Agri Services Laboratory Inc.
Ainley & Associates
Air Canada
Altken Smith Carter Partners
Avis & Swansone
Al-Kantti Brisbin & Woodman
Lac Alarie Sons Ltd.
Alberta Gas Ethylene Company Ltd.
Alberta Research Council
Alcan Ltee Societe d’Electrolyse
e de Chimie
Alcan Canada Products Limited
Alcan Foil Products
Alcan Smelters & Chemicals Ltd.
The Algeana Steel Corp. Ltd.
Allifax Inc.
Allen-Bradley Canada Ltd.
Lotus A. Allen & Co.
Allen Miles Fox & Johnston
Allinson-Ross Corp’n
Allstate Insurance Company of Canada
Airotee Cosmetics of Canada Inc.
John J. Amburss Architect
Amcor Computer Corp.
Amdahl Communications Inc.
American Express Canada Inc.
AMS Canada Inc.
Ancaster Aquatic Centre
c/o Town of Ancaster
Arthur Andersen & Company
Andrishak & Sturgess Architects & Urban Designers
Anglican Diocese of Algoma
H.H. Angus & Associates Ltd.
Annapolis County District
Ont. Min. of Transportation
Antel Optronics Inc.
Ont.
Apotex Inc.
Apple Canada
Applewood Heights Secondary School
Arccop Architects Planners
Arccop Associates
Argonaut Rowing Club
Arjay Engineering
Armco Westeel Inc.
Arrell Observation & Detention Home for Children
Armcraft Corporation
Arrowhead Metals Limited
Arvak Management Inc.
Association of Municipal Clerks & Treasurers of Ontario
Assumption Mutual Life Insurance Company
Astra Pyrotechnics Canada Limited
ASW Computer Systems Ltd
Atkinson Tremblay & Assoc. Inc.
Atlantic Packaging Products Ltd.
Atlantic Flight Research Inc.
Atlea Supply Company of Canada Ltd.
Atomic Energy of Canada
Ault Dairies Ltd.
Ault Foods Ltd.
The Austin Company Limited
P.C. Automation Inc.
Automation Tooling Systems Inc.
Avery Label Systems
Aviscar Inc.
Babcock & Wilcox Canada
Bailey Controls
Baxelite Thermosets Limited
Balderson Mielke & Co.
Baldwin & Franklin
Dr. Ballard’s Pet Foods
Kenneth W. Ball & Company
Balmoral Hall
Banff Recreation & Leisure Services
Bank of Canada
Bank of Montreal
Bank of Nova Scotia
Barbados Light & Power Ltd.
Barbecon Inc.
Barber Hydraulic Turbine Ltd.
Subsidiary of Marsh Engineering
Barclays Bank of Canada
W.E. Barnett Architect
Barton Tubo Limited
Basf Canada Inc.
Bata Limited
J. Bruce Bateman
Bathurst Pain & Sports Medicine Clinic
Baycrest Hospital
Beyly Engineering Ltd.
Bay Mills Midland Ltd.
Bayview Wildwood Resorts
BBM Bureau of Measurement
Beaton Wills & Jefferson
Beaver Engineering Limited
Beaver Lumber Company Limited
Bebris Associates Architect
Site Planner
Becker Milk Company Limited
Bedford Institute of Oceanography
Belkin Paperboard
Bell Canada
Bell Cellular Incorporated
Herman J. Bell
Bell-Northern Research
Bel-Tronics
G.E. Bemi & Associates
Bendix Electronics Ltd.
Bently Nevada Canada Ltd.
Bentastics Limited
Biokinetics and Associates Limited
Bird Archer Inc.
Bird Construction Company Limited
Birnbaum Prenick Stekel & Co.
Bishop Strachan School
Bison Marketing Systems
Black & McDonald Ltd.
Boluse Metal Products
Blue Mountain Resorts Limited
John Blums Architect
Body Check Parkdale II Plaza
Boehringer Ingelheim
Boeing of Canada Limited
Arm prior Division
Joseph Bogdan
Boise Cascade Canada Ltd.
Bolair Distribution Inc.
Borden Chemical Co. (Can.) Ltd.
Bouris Wilson Scott & Proctor
Borg-Warner (Canada) Limited
Boyle-Midway (Canada) Limited
Boyne River Natural Science School
The Braemen Group
Bramalea Limited
Branchton Camp
Brantford P.U.C.
Breithaupt Centre
Brevik Scorgie Wasylyko Architects Inc.
Brentwood Sales
Bresliube Enterprises
Brian Engineering Limited
Briestensky Architoid Ltd.
Brisbin Brock Beynon
Bristol-Myers Manufacturing
Britannia Secondary School
British Columbia Systems Corp.
Brockhouse Canada Limited
Brookside School
Brouwer Turf Equipment Limited
Brown Manufacturing Ltd.
H.D. Brown Enterprises
Randall Brown & Assoc.
Brunton Browning Day & Partners
Building Design Partnership
Bundy of Canada Limited
Burgess Vibro-Acoustics Ltd.
R.V.B. Burgoyne
Burlington Sports Medicine and Physio Centre
Burns Fry Ltd.
Butch Correctional Centre
Butler Metal Products Co. Ltd.
Butler Polymet
Bytes of Learning Inc.
Cabient Ltd.
Edmund Cahia & Co.
Cadence Computer Corporation
Cadillac Fairview Corp. Ltd.
CAE Electronics Ltd.
Caledon Laboratories
Callous Systems Inc.
Cambrian College of Arts and Technology
Cambridge International College
Camco Inc.
Camosie Limited
Cami Automotive Inc.
Co-operative Education and Career Services
Organizations Employing Co-operative Students

Camp Huronda
Camp Oconto
Camp Tawingo
Camp Wahandwin
Camp Wanakita Hamilton YMCA Office
Camp Wanakita Outdoor Centre
Canada Cement Lafarge Limited
Canada Colors & Chemicals Limited
The Canada Consulting Group
Canada Employment & Immigration Commission
Canadair Limited
Canada Life Assurance Co.
Canada Ontario Centre for Advanced Manufacturing
Canada Packers Limited
Canada Post Corporation
Canada Square Resins Ltd.
Canada Starch Company inc.
Canada Systems Group
Canada Trust
Canada Wire & Cable Limited
Canadiana Outdoor Products Inc.
Canadian Astronautics Limited
Canadian Blower/Canada Pumps Ltd.
Canadian Broadcasting Corporation
Canadian Canners Limited
Canadian Centre for Creative Technology
Canadian Centre for Occupational Health and Safety
Canadian Depository
Canadian Forestry Service Great Lakes Forest Research Centre
Canadian General Electric Co. Ltd.
Canadian Gypsum Co. Ltd.
Canadian Imperial Bank of Commerce
Canadian Industrial Innovation Centre
Canadian Industrial Risks Insurers
Canadian International Development Agency
Canadian Liquid Air Limited
Canadian Marconi Company, P.O. Box 13330
The Canadian National Institute for the Blind/Ontario Division Canadian National Railways
Canadian Pacific
Canadian Posture & Seating Centre
The Canadian Press
Canadian Red Cross Blood Transfusion Service
Canadian Red Cross Ontario Division
Canadian Red Cross Society
Canadian Standards Association
Canadian Superior Oil Ltd.
Canadian Tire Acceptance Ltd.
Canagro Agricultural Products Ltd.
CAN/AM Tech. Inc.
Canbar Products Limited
Canron Inc.
Canstar Communications
Cape Breton Coal Research Lab
Carborundum Abrasives Inc.
Carleton Board of Education
Carleton Roman Catholic School Board
Carling O’Keefe Limited
DM Industries
Carolina Systems Inc.
Carousel Theatre
Carrier Lumber
Caruthers Shaw and Partners Limited
Cashway Building Centre
Catelli Ltd.
Cawthra Park Secondary School
CCH Canadian Ltd.
CCL Industries Inc.
Ceeco Group
Cemcorp
Centerline (Windsor) Limited
Central Dynamics Limited
Centralla College
CFTS Hq
Champ Engineering
Champion Truck Bodies
Chapman Taylor Partners
Chasson & Greenhass
Chateau-Gal Wines Ltd.
Chedoke-McMaster Hospital
Chedoke Division
Chembond Limited
Chemetics International Company
Chenery Glenn & Graydon
Chipman Inc.
Chiquita Foods Canada
Chrysler Canada Limited
Ciba-Geigy Canada Ltd.
CIL Inc.
Citadel General Assurance
Citibank Canada
City of Barrie
City of Brampton Engineering Department
City of Brantford
City of Burlington
City of Chatham
City of Elbecoike
City of Hamilton
City of Kitchener
City of London
City of Mississauga
City of Niagara Falls
City of North York
City of Peterborough
City of Sarnia
City of Sault Ste. Marie
City of Scarborough
City of St. Catharines
City of Sudbury
City of Thunder Bay
City of Toronto
City of Vanier
City of Waterloo
City of Windsor
City of York
Citywide Scale Co.
Clarke Darling Downey Architects
Clarke Henning & Co.
Clarke Institute of Psychiatry
Clarke Stark & Diegel
Clarkson Gordon
Clifford & Lawrie Architects Inc.
John Clinkett Architect
R.E. Clipsham Limited
CMII Engineering Specialties
CN Communications
CNCP Telecommunications
CN Rail
Coca-Cola Ltd.
Cognos Incorporated
Coleman & Company Chartered Accountants
Cole Sherman & Associates Limited
Colgate-Palmolive Canada
Collo Wines of Canada Ltd.
James A. Colizza
Collins Barrow Chartered Accountant
Collins Publishers
Color Your World Inc.
Coom Dev Ltd.
Communications Engineering Services Ltd.
The Communications Project
Communications Security Establishment
Compar/Div. of DGW Electronics Corp.
Comptrol Development Group Inc.
Compuite Software Inc.
Computing Devices Company
Comshare Limited
Concord Scientific Corp.
Conestoga Medical Electronics Ltd.
Conestoga-Rovers & Associates
Conestogo Medical Electronics Ltd.
Confederation Life Insurance Company
Conin Engineering & Planning Ltd.
Connaught Research Institute
Connectdata Inc.
Constellation Assurance
Consumers Gas Company Limited
Consumers Glass Co. Ltd.
Consumers Packaging Inc.
Continental Bank of Canada
Continental Can
Contour Computer Corp.
Control Data Canada Limited
Control Dynamics Inc.
Control Microsystems Inc.
Co-operators Data Services Limited
Co-operators General Insurance Company
Cooper Construction Co. Ltd.
Cooper Millson & Foster
Coopers & Lybrand Chartered Accountants
Corby Distilleries Limited
Cornwall Electric
Corporate Foods Ltd.
Council for Business and the Arts in Canada
County of Hastings
County of Huron
County of Perth
Courtice Steel Ltd.
Cox Hyatt & Co. Chartered Accountants
Cox Snowdon & Merritt
C.P.A. Datasystems
C.P. Rail – Ogden Shop
CPRI
C.P. Trucks
John Crane Canada Inc.
Crang and Boake Inc.
Curie Geophysics Ltd.
Crouse-Hinds Canada Ltd.
Crown Life Insurance Company
Crowntek Sales Inc.
CSL Silicones Limited
Cullen Gardens & Miniature Village
Cumis Life Insurance Company
R.G. Cunningham & Associates
Cyamind Canada Inc.
DADA – Designing Aids for Disabled Adults
Daiwa Inc.
Dantec Electronics
Darcy Place
Darnell Inc.
Data General (Canada) Inc.
Datapoint Canada Inc.
Datsym Inc.
Davis Engineering
Co-operative Education and Career Services
Organizations Employing Co-operative Students

DCP Canada Inc.
Dean Tucker Shaw Architects
Deb Swarfega Inc.
De Iauri Cathar Canada Ltd.
Dellotte Haskins & Sells
Deloro Stellite
Delphax Systems
Dentofacial Software
Dept. of Environment Parks Canada
Dept. of Fisheries & Oceans
Dept. of Indian & Northern Affairs
Department of National Defence
DesmaraisArsenault & Co.
Devcon Electronics Ltd.
Dewit & Castellan
D.H.J. Research
Diagnostic Chemicals Ltd.
Dialectic Computer Services
A.J. Diamond Associates
Digital Equipment of Canada Ltd.
Digital Video Systems Ltd.
Dipex Systems Limited
Diversely Wyandotte Inc.
Diversified Products of Canada
Diversified Research Laboratories
Dixon Gordon & Company
DMR & Associates
DMR Group Inc.
Doane Raymond Chartered Accountants
Dofasco
Dome Exploration (Canada) Limited
Dominion Securities Pitfield Ltd.
Domtar Chemicals Group
Domtar Fine Papers Limited
Domtar Packaging Limited
Donn Canada Ltd./Lee
Dorval Computer Centre
Dow Chemical Canada Inc.
Downs/Archambault
Downy Canada Electronics Limited
Downy Equipment of Canada Limited
Dreif Bakers Equipment Inc.
Dufferin Construction Co.
Dunlop Farrow Atken Cansfield
Dunwoody & Company
Dupont Canada Inc.
Durand and Luey Chartered Accountants
Durham Board of Education
Durham College of Applied Arts & Technology
Durham Resources Inc.
Durward J.ans Rarkwell & Company
Dustbane Enterprises Limited
Dyad Computer Systems Inc.
Dylex Limited
Dynatech Communications Ltd.
DY-4 Systems Inc.
East York Board of Education
Eaton's College Education Centre
Easy Net Systems Inc.
Eaton's
E.C.E. Group
Economical Mutual Insurance Cooperative
Economic Council of Canada
E.B. Eddy Forest Products Ltd.
E.D.S. of Canada Ltd.
E.H.M. Inc.
Eicon Technology Corporation
E.L.B. Associates Inc.
Electrohome Limited
Fil Lilly Canada Inc.
Ellis-Don Limited
Elmhirst Resort
Emco Ltd.
Emery Industries Ltd.
EMJ Data Systems Ltd.
Energy Mines & Resources
Energy Mines & Resources Canada
Enenermodal Engineering Ltd.
Engineering Interface Limited
England Naylor Engineering Ltd.
Enproco Limited
Environment Canada
Epton Industries Inc.
Equity Silver Mines Ltd.
Erco
Arthur Erickson
Erindale College Athletic & Recreation Dept.
Ernst Leitz (Canada) Ltd.
Erskine Limited
Esso Chemical Canada
Esso Minerals Canada
Esso Petroleum Canada
Esso Plaza Physical Fitness & Lifestyle Program
Esso Resources Canada Ltd.
Etatech Industries Inc.
Etobicoke Board of Education
Etobicoke Hydro
Ethyric Design Inc.
Evans Martin & Co.
Excel Tech Limited
Exco Engineering
Exemplar Systems Corp. Contractors
& Engineers
Exide Canada Corp.
Export Development Corporation
Evlink Inc.
Falconbridge Limited
Family Service Association
Fammie & Co. Chartered Accountants
Fathorm Oceanology Limited
Federal Bolt & Nut
Feldman & Truscott
Ferguson & Ferguson
Fermar Paving Limited
Ferranti-Packard Limited
Fiberglas Canada Inc.
Financial Models Co.
M. Finkelstein & Partners
Firestone Canada Inc.
Firestone Textiles Co. Div.
Fisher Controls Co. of Canada Ltd.
Fisher Gauge Ltd.
Flanagan Beresford & Patterson
Flavonite Poultry Limited
Flies Gates McGowan Easton
Forbes Lord Feldborg Schmidt & Croll
Ford Electronics Manufacturing Corporation
Ford Glass Ltd.
Ford Motor Company of Canada Ltd.
Forest City Kiwanis Community Centre
Forest Engineering Research Institute of Canada
Forest Pest Management Institute
Forentek Canada Corp.
Four Star Software
Fox Glicksman & Company
Frankel Steel Ltd.
Fraser Inc.
Fraser Sweatman Industries
Freze Homes
Frontenac Lennox & Addington
Roman Catholic Separate School Bd.
Galataco Inc.
Gandalf Data Limited
Garrett Manufacturing Limited
Gartner & Lee Associates
Gastops Limited
Asbjorn R. Gathe
Gaviller & Company
Geac Canada Limited
Gelman Hayward & Partners Ltd.
General Foods Inc.
General Motors of Canada Limited
Gecanex
Geological Survey of Canada
Atlantic Geoscience Centre
Georign College of Applied Arts & Technology
Gensearch Consultants Ltd.
Geovision Corporation
Gibbons Foods Div. of Eden Manufacturing Co. Ltd.
Griffen Associates Ltd.
Gigatek Limited
Gilmore Walsh & Co. Ca's
Ginsberg Gluzman Fage & Levitz
Glauk Canada Ltd.
L.E. Glazer Architect
Glenayre Electronics Ltd.
Glenarry Industries
Goebel Wagner Macadam
Gold Fields Canadian Mining Corp.
Steven A. Goodman Chartered Accountant
B.F. Goodrich Canada Inc.
B.F. Goodrich Chemical Canada
J.E. Goodwin FCA
Goodyear Canada Inc.
Gordon Graydon Memorial Secondary School
Gore & Storrie Limited
Go Transit
Grand River Conservation Authority
Greater Niagara General Hospital
Great Lakes Forest Products Ltd.
Green & Dingled
Greenwood Cook & Company
Griff Harendorf Lebane Hoffmann & Merrick
Griffith Laboratories Ltd.
Grouptheory Systems Incorporated
G.S.W. Building Products Company
Guardian Insurance Co. of Canada
Gaupll Hydro
Gulf Canada Limited
Zenon Gulkowski Chartered Accountant
The Halifax Insurance Company
Hallowell House Limited
Robert Haissl & Assoc. Ltd.
Halton Hills Hydro Electric Commission
Halton Region Conservation Auth.
Hamilton Board of Education
Hamilton Civic Hospital's Personnel Office
The Hamilton Harbour Commissioners
Hamilton Philharmonic Orchestra
Hamilton Psychiatric Hospital
Hammond Manufacturing Co. Limited
Harbourfront Corporation
Doughard Arsc Architect
Hady Holzman Pfeiffer Associates
Harris Tile & Partners
Co-operative Education and Career Services
Organizations Employing Co-operative Students

Walker/Tenneco
Walker Wright Associates Ltd.
Walt Disney World
Waltex Bathware
Waltex Plastics
Waltex Sinkware
Walter Fedy McCargar Hachborn
Paul B. Walters & Associates Ltd.
Consulting Engineers
The War Amputations of Canada Key Tag Service
Wardair Canada (1975) Ltd.
Ward Mallette
Warner-Lambert Canada Inc.
Watcom Products
Watcom Systems Inc.
Waterloo Arts Research Group
Waterloo County Board of Education
Waterloo Information Systems Ltd.
Waterloo Metal Syampings Ltd.
Waterloo Microsystems Inc.
Waterloo Minor Baseball University of Waterloo
Waterloo Scientific Inc.
Waterloo Womens Club
Brain F.J. Watkinson Architect
Weall & Cullen Nurseries
Geo. A. Welch & Co.
Wellington County Board of Education
Werleman & Guy
West Bend of Canada Ltd.
Westbury Life Insurance Co.
Westeel
Western Foundry Co. Ltd.
Western Ontario Breeders Inc.
Westinghouse Canada Inc.
Westmount Golf & Country Club
West Park Hospital
Whitby Hydro Commission
White Johnson & Company
Wilkinson & Company
Wilson Young and Associates
R.E. Winter & Associates Ltd.
Women's Directorate
Woodbridge Foam Corp.
Woodfieald Lodge
Carson Woods
Woods Gordon
F.W. Woolworth Co Ltd.
Workers' Compensation Board
Oleson Worland Architects
Worthington Pump Division Dresser Canada Inc.
Wright & Baker Co. Ltd.
The Wyatt Company

WZMH Group Architects Ltd.
W5 Associates Inc.
Xerox Canada Inc.
Xerox Research Centre of Canada
Xicor Technologies Corp.
Xios Systems Corporation
Yip & Ritedale Architects
YMCA Collingwood District
YMCA Kitchener-Waterloo
Family Y Branch
YMCA of Metropolitan Toronto
YM-YWCA London
York Central Association for the Mentally Retarded (YCAMP)
York County Hospital
York Hydro
Yorklea Children’s Centre
Yorkville Sound Ltd.
F.H. Young Architect
Young & Wright Architects
YWCA Calgary
R.S. Zacks
Zepf Technology Inc.
Zittrer Siblin Stein Levine & Co.
Zochem Div. of Hudson Bay Mining
Zurich Life Insurance Co. of Canada
3M Canada Inc.
The University Library
The University Library

University Librarian
M. C. Shepherd, BEd (Saskatchewan), MA (LS) (Denver)

Associate Librarian, Planning & Systems
C. Presser, AB (Hunter), MLS (Pratt)

Co-ordinator, Library Administrative Services
L. Beattie, BA (Loyola of Montreal), MA, PhD (Waterloo)

Special Collections Librarian
S. Bellingham, BA (Waterloo Lutheran), MLS (Western Ontario)

Librarian
J. Eadie, BA (Queen's), MLS (Western Ontario)

Business Administrator
J. Jorgensen, BA (Toronto)

Co-ordinator, UW Press
G. Smith, ARCT (Toronto), BA (McMaster)

Collections Division

Associate Librarian, Collections
C. D. Emery, BA (Durham), ALA

Head, Cataloguing Department
W. Oldfield, BA (Waterloo Lutheran), MLS (Western Ontario)

Cataloguers (Catalogue Department)
H. Calogeridis, BA, MLS (McGill)
Y. Gordon, BA (Manitoba), BLS (Toronto)
L. Helfand, BSc (York), MLS (Western Ontario)
R. Lamb, BA (Guelph), 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)

Collections Development Librarian
L. Leger, BSc (Toronto), MLS (Western Ontario)

The University Library

Public Services Division

Associate Librarian, Public Services
B. MacNeil, BSc (Laurentian), MLS (McGill)

Co-ordinator, User Education
G. Draper, BA, MA, PhD, 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
L. Claxton, BA (Waterloo), BLS, MLS (Toronto)

Head, Arts Reference & Collections Development Department
T. Eadie, BA, MA (Queen's), MLS (Western Ontario)

Reference & Collections Development Librarians
M. Aquan-Yuen, BA, MLS (Toronto), MA (Waterloo)
J. Beglo, BA (Waterloo Lutheran), BA (Waterloo), MA, MLS (Toronto)
D. Binkley, BA (Toronto), MLS (Western Ontario)
M. Blok, BA (Waterloo), MLS (Western Ontario)
R. Crusz, BA (Ceylon), BLS (Toronto), MA (Waterloo)
D. Fitzpatrick, BA, MA (Windsor), MLS (Toronto)
A. Lakos, BA (Jerusalem), MLS (British Columbia)
G. Man, BSc (Wisconsin-Oshkosh), MLS (Toronto)
S. Moskal, BSc, (Wisconsin-Madison), MLS (Western Ontario)

Head, EMS Reference & Collections Development Department
Joan Macdonald, BSc, BEd (Dalhousie), MLS (Western Ontario)

Reference & Collections Development Librarians
J. Cummings, AB, MLS (California, Berkley)
D. Harding, BSc (Guelph), MLS (Western Ontario)
A. Hansen, BEng (McGill), MLS (Dalhousie)
W. Macpherson, BSc, MLS (Dalhousie)
J. Parrott, BSc (Queen's), MSc, BLS (Toronto)

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)
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 Engineering, Mathematics and Science Library; one branch library, the University Map and Design Library; and one reading room, the Optometry Reading Room.

The Dana Porter Library, ten stories high and situated in the centre of the campus, is the focal point of the University. 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 160 readers, the Doris Lewis Rare Book Room, the microform collection, and eight typing cubicles. The second or main floor contains the public catalogue, the circulation counter and the Information Desk. Also on the main floor is the Current Periodical Reading Room, the Interlibrary Loan Office and the Reference Collection. The periodical and newspaper collections are located on the third floor. Government publications are located on the fifth 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 1,800,000 items including books, pamphlets, theses, microforms, documents, reports, sound recordings and other material. The Library subscribes to over 6,000 periodicals and over 50 newspapers.

The Engineering, Mathematics and Science Library occupies the fourth floor of the Mathematics and Computer Science Building. The three principal public areas - the Catalogue, the Circulation and Information Desks - are visible from the entrance to the Library. Seating is provided for 776 readers.

The E.M.S. Library collection numbers over 400,000 items including books, microforms, government publications, technical reports and maps. The Library subscribes to over 4,000 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 95,000 items including maps, air photographs, books, theses, and periodicals. The resources of this library, like those of the Dana Porter and EMS Libraries, are available to all members of the University.

The Optometry Reading Room 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.

The Community Access Module (CAM), an extension of the circulation system, provides library users at remote locations with access to the Library's author, title and call number files. A computer terminal and a valid library borrower's card are needed to use CAM.

The Library provides a Machine Assisted Reference Service (WATMARS) which is a quick and efficient method of searching databases by computer. There is a charge for the service based on the database being searched, the amount of time required to conduct the search and the number of references obtained.

Special services including a brailer and a four-track cassette recorder and playback unit are available for the visually handicapped. A room on the seventh floor of the Dana Porter Library is 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. All libraries are accessible by wheelchair.

The Federated and Affiliated colleges (St. Jerome's, Conrad Grebel, St. Paul's and Renison) have their own libraries which are accessible to University of Waterloo students, staff, and faculty. Conrad Grebel College Library has approximately 13,000 items which include a special collection on Peace Studies. It is also the home of a Mennonite Archive which consists of church records and documents of the Mennonites of Ontario. St. Jerome's College Library has a collection of about 29,000 volumes. St. Paul's College Library has about 3,000 books specializing in the areas of Religious Studies and Canadian Studies. The 5,000 volumes in the Renison Library serve the College's Social Development Studies Program and its courses in Third World 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, 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 in 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 classification system, the card catalogues, the serials list and general rules and procedures. Also available are other publications, such as bibliographies and guides to using the reference materials.

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
Computing Services on Campus

DEPARTMENT OF COMPUTING SERVICES

Director
P. H. Dirksen, BSc, MA (Waterloo)

Associate Directors
J. W. Dodd, BASc (Toronto), MSc (Waterloo)
- Operations
J. P. Sprung, BASc (Toronto), MA (Waterloo)
- Information Systems & Planning
R. W. Watt, BSc, MMath (Waterloo)
- Systems

Manager - User Services
B. E. Uttley, BMath (Waterloo)

The Department of Computing Services provides computing facilities and services for faculty, staff, graduate and undergraduate students. These facilities include terminals, program preparation areas, high-speed printers, a wide variety of microcomputers, an incremental plotting facility, and other computer hardware and software chosen to handle the wide range of computing applications in a university community. Faculty, academic staff, graduate and undergraduate students, use the computing facilities to aid them in their research. In addition, many academic courses require the use of computers in course assignments. Administrative staff use computers in applications such as student records, course timetables, examination results and financial accounting.

Almost all computer services offered by the Department are interactive. Undergraduate students have access to microcomputers, which are connected in groups to shared disk storage systems and to key driven CRT terminals which connect them to controlled environments on large time-sharing computers. More advanced users have access to all the facilities of the VM/370 CMS operating system which provides both a time-sharing environment and a general BATCH environment. Text-editing software, including special software to handle mathematical symbols, automatic typesetting, other applications' packages and specialized environments such as APL are all available.

The Department provides terminals which are accessible to anyone who has been authorized to use the computer services. Printed and hard-copy graphic output can be retrieved from local printers or from a large I/O (Input/Output) operations room located in the Math and Computer Building. Many users have the use of remotely located terminals which gain access to VM/370 CMS over sophisticated communications systems, including the SYTEK local area network.

Off-campus access to the system is possible over the ordinary telephone system, or through DATAPAC, the digital network operated by Bell Canada.

In addition to the computing facilities and services outlined above, the Department of Computing Services provides several "user services." Programming consultation, non-credit courses and seminars, documentation, computer reference room facilities, and newsletters are provided by the user services personnel of the Department to help make using the computer an easier and more efficient process for all members of the University community.

ARTS COMPUTING OFFICE

Manager
V. G. Neglia, BSc (Waterloo)

The Arts Computing Office (ACO) is a computer resource and consulting facility for members of the Faculty of Arts. The Office addresses the special computing needs of those in the Humanities and Social Sciences. To this end the office is staffed by consultants available to help users with their problems.

The ACO operates a UNIX system on a VAX 750 computer, a VMS system on a VAX 785 computer and two separate networks of IBM PC microcomputers. Both UNIX and VMS systems are connected to the CMS system operated by the Department of Computing Services, enabling file transfer and electronic mail services between these systems.

Both undergraduate and graduate students registered in the Faculty of Arts may apply for a computer account with which they may do word processing. This account is available over and above any computer access provided by a specific course. Draft quality documents may be printed on a high speed line printer or a matrix printer which are available on a self-serve basis. Documents requiring high quality may be printed on an Apple Laser printer or a Diablo 630 ESC daisy wheel printer.

Public terminals and microcomputer workstations reserved for use by members of the faculty are located in PAS 1098, PAS 1080, PAS 1084, HH 236 and HH 237. Printer facilities are located in HH 236, PAS 1099 and PAS 1077.

MATHEMATICS FACULTY COMPUTING FACILITY

Director
J. W. Wong, BS, MS, PhD (California - Los Angeles)

Manager - Operations
G. P. Embro

Manager - Software
W.C.W. Ince, MMath (Waterloo)
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.

Currently, the systems operated by MFCF include a Honeywell DPS8/49, eight VAXen (four 11/780s, three 11/785s, and an 8600), a dozen Sun 3/50 workstations, and a Sun 3/180 fileserver. The Honeywell runs the GCOS8 operating system, the VAXen run Berkeley UNIX, and the Sun workstations run Sun's version of Berkeley UNIX. Software includes several text editors, electronic mail, user-controlled archiving, plotting, text formatting, and a wide range of general and special-purpose languages. Batch processing is also provided under GCOS8.

For the VAX systems and Sun workstations, communication between machines is primarily implemented with Ethertnets. High-speed dedicated links provide communication between the Honeywell, the VAXen, and the IBM mainframes (operated by the Department of Computing Services). Traffic between machines consists primarily of file transfers, electronic mail, print requests; and remote logins (between UNIX systems). 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 exist (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. Most public terminals are connected to the Sytek network. Hard-copy output can be obtained from a variety of devices, e.g., line printers, laser printers, and an APS Micro 5 phototypesetter.

MFCF also provides software support (Berkeley UNIX on VAX) in varying degrees to researchers in the Institute for Computer Research. Such support is performed jointly with staff members of that institute.
ENGINEERING EDUCATION RESEARCH CENTRE

Associate Dean of Engineering for Computing
B.L. Wills, BASc, MASc, PhD (Waterloo), PEng

The Engineering Education Research Centre has been recently established with the help of corporate sponsors. Initially, the resources include two VAX 11/785s, graphics workstations, several printers and plotters. This computing equipment, in conjunction with new developments in data communications at the University, will provide a very powerful and useful general facility for Engineering. The Centre will be able to support many graduate and undergraduate projects in areas such as CAD/CAM, Computer Aided Instruction, Computer Aided Engineering, and Computer Graphics.

SCIENCE FACULTY COMPUTING

Associate Dean for Computing
C. I. Mayfield, BSc, and PhD (Liverpool)

Computer Liaison Officer
A. Fleming, BMath (Waterloo)

The Faculty of Science has a broad range of different computer facilities available to undergraduates. Many courses are taught using the IBM mainframes and each student in those courses is issued an account. In addition, there is a JANET network in each of the four departments and the School of Optometry and these networks are used by students in many courses. The JANET 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. There is also an experimental network in the Department of Earth Sciences which uses Digital Equipment Corporation Rainbow microcomputers. 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.

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.
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 Registrar's Office (Needles Hall) 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 | Latin |
| Classical Studies | Medieval Studies |
| Drama and Theatre Arts | Music |
| Economics | Philosophy |
| English | Political Science |
| Fine Arts | Psychology |
| French | Religious Studies |
| Geography | Russian |
| German | Social Development |
| Greek | Studies |
| History | Sociology |
| Latin | Spanish |

The following four-year General BA programs are also available:

| Anthropology | Geography |
| Classical Studies | History |
| Drama | Philosophy |
| Economics | Political Science |
| English | Psychology (ECEC) |
| Fine Arts | Religious Studies |
| French | Spanish |

There are no minors or double majors in 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.

Note 1
It is recommended that students register in no more than five courses in a term unless they have achieved at least a B average in previous studies and have discussed their situation with an academic counsellor.
HONOURS PROGRAMS

1. Regular Programs
An Honours Bachelor of Arts (BA) degree is offered by the University in the following disciplines:

- Accounting
- Anthropology
- Classical Studies
- Drama and Theatre Arts
- Economics
- English
- Fine Arts
- French
- Geography
- German Studies
- History
- Latin
- Medieval Studies
- Music
- Philosophy
- Political Science
- Psychology
- Religious Studies
- Russian
- Slavic Studies
- Social Development
- 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 programs. 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 p. 8:9.

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 alternates four-month terms on campus for academic studies with four months off campus for practical training in business, industry, or government.

Students in departmental 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 1)
- Co-op Honours Anthropology
- Co-op Honours Applied Economics
- Co-op Honours Chartered Accountancy Studies
- Co-op Honours English

Co-operative Programs are open to full-time students only.

Notes:
1. 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, most Honours Programs in Arts at the University may be combined with the Applied Studies courses for this Co-operative program. See the section entitled “Departmental Programs” for details.

2. It is recommended that students register in no more than five courses in a term unless their program requires six or they have achieved at least a B average in previous studies and have discussed their situation with an academic counsellor.

MINOR PROGRAMS
Students enrolled in Honours Programs in Arts or 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. Students in some General Programs may choose one of several available Options. Options are available in:

- Canadian Studies (Option or Minor, see Chapter 15)
- Gerontology (Minor, see Chapter 15)
- Iberoamerican Studies (Option, see Chapter 15)
- Legal Studies (Option, see Chapter 15)
- Management Studies (Minor, see Chapter 15)
- Middle East Studies (Option, see Chapter 15)
Peace and Conflict Studies (Option or Minor, see Chapter 15)
Personnel and Administrative Studies (Minor, see Chapter 15)
Society, Technology and Values (Option, see Chapter 15)
Studies in Personality and Religion (Option or Minor, see Chapter 15)
Women’s Studies (Option, see Chapter 15)

Note: Normally a student may not count any course for more than one option or minor.

SELECTION OF YEAR 1 PROGRAMS
All Year One students are officially classified as being in the General Arts Program, the Arts Co-op Program or the Accounting Co-op Programs. Students in Accounting Co-op programs have a highly specified first year and should refer to the Accounting Program section. Students in General Arts and Arts Co-op do not select a specific major or Honours program until Year Two. The first year is a broad exploratory year, and the student should select a program of courses that keeps as many options as possible open for advanced work. Students admitted to Arts Co-op must select several required courses in Year One (see “Applied Studies,” Departmental Programs). Students in Year One General Arts usually choose five term courses in both the fall and winter terms. In each term, students usually select two courses from disciplines in Group A and two from disciplines in Group B (see Degree Requirements), with one or two more courses as electives. In choosing courses, students are encouraged to select courses in any discipline in which they may hope to major. (Students are advised that a six-course work load may be quite heavy.) 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.

COURSE 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 his/her program will serve his/her academic interests.
4. Courses offered during the Summer Session may be added or dropped during the first three days in which the course begins 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.

It is important that students settle down in their schedule of courses just as quickly as possible. Students usually find that courses they add late in the second week of classes pose special problems in catching up with the work already covered.

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 (B.A. or B.Sc. 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
nine credits in the subject for one area of specialization,
or
14 credits in two subjects (no fewer than six 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 either:

1) a minimum of 16 term courses or their equivalent beyond the 100 level

or

ii) courses from no more than seven disciplines

and

the Faculty of Arts Group A and B requirements (see below) must also be met.

**General Non-Major Program**

Students in the General program may graduate as non-majors upon completion of a minimum of 30 term courses with a passing mark in each including:

i) a minimum of 16 term courses beyond the 100 level,

ii) a minimum of 15 term courses in the Faculty of Arts,

iii) the Faculty of Arts Group A and B requirements (see below).

A cumulative average of 60% is required 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), 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**

Over the past several years the Faculty of Arts has become concerned that some students may experience academic difficulties because they lack the basic writing skills required for university work. In order to help these students the Faculty 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 50% on the English Language Proficiency Examination or by demonstrating this competence in their Writing Clinic assignments.

Students who receive a mark below 50% 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.

**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) Dutch, French, German, Greek, Italian, 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:

1. R S 105: Elementary Biblical Hebrew and R S 106: New Testament Greek may be used to meet the Group A (ii) requirement.
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, or ITAL 291, ITAL 292. These courses are taught in English and are not open to first year Arts students. These courses are the only approved alternative to the A (ii) requirement.

Other courses taught in English by language departments are not approved alternatives to the A(ii) requirement. This will be indicated after the course description with a note such as “Taught in English” or “Does not meet A(ii) requirement”.

3. ARTS 100A: Introduction to the Humanities A may be used as a term course in Group A(iii) and ARTS 100B: Introduction to the Humanities B 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 1:7.

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 term may be used, in part or in whole, in determining grades. At the discretion of the chairman of the Department 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.

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.
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>
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<td>B-</td>
<td>72</td>
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<td>C-</td>
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<tr>
<td>D+</td>
<td>58</td>
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<tr>
<td>D</td>
<td>55</td>
</tr>
<tr>
<td>D-</td>
<td>52</td>
</tr>
<tr>
<td>F</td>
<td>32</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 his 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 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 terms 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 Sénior 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. 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 refer to the following tables.

The following tables indicate sets of courses all of which have overlapping content. A student in an Arts Faculty program may take only one course from each set for credit.

Set A - Basic Statistics Courses
ARCH 103, ECON 221, ENV S 271, ISS 250R, KIN 222, P SCI 214, PSYCH 201, PSYCH 292, REC 270, REC 371A, SOC 202, SOC 280, STAT 202, STAT 204, STAT 210, STAT 221.

Set B - Advanced Statistics Courses
KIN 330, PSYCH 202, PSYCH 391, STAT 205, STAT 304.

Course Load

Regular full-time students in both General and Honours Arts programs normally register for five, or occasionally six, term courses each academic term. Full-time students in General Arts programs may register for more than six term courses per academic term only with the consent of the Examinations and Standings Committee. Full-time students in Honours Arts programs may not enrol in more than one term course per academic term in excess of the number specified for their program (see Departmental Honours
Correspondence Courses
Because of the different start dates and the different
final exam periods for correspondendonoo and on-campus
courses, students enrolled in full-time on-campus
courses must have the permission of their Under-
graduate Advisor and the Examinations and Standings
Committee to register for a Correspondence Course.

Part-Time Studies
Students may pursue degree studies part-time (in both
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.
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 higher average), the student may be
granted conditional status for two academic terms.
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 higher
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
Chairman, 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) 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 two terms’ absence. 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.

The academic record of each student enrolled in a
degree program is examined after the completion of at
least ten term courses. Each record is examined again
after the completion of a minimum of ten further term
courses from the point of any previous considerations
and each student’s academic record is examined at
graduation. To be included on the Dean’s List the
student must have achieved a cumulative overall
average greater than or equal to 83.0%. A student
with an INC or NMR grade is not eligible for inclusion
on the list.

A student on the Dean’s List receives a
congratulatory letter from the Dean and the award is
noted on the student’s transcript.

Grade Appeal Procedures
1. If an Arts student wishes to appeal a grade in a
course administered by the Arts Faculty, the
student should (as soon as possible and at the
latest within six months of receipt of the grade) try
to work the matter out informally with the instructor
concerned. If the problem cannot be resolved in
this way, the student may submit a formal, written
appeal to the appropriate department chairman or
head of the affiliated colleges or dean of the
federated college. Because of their familiarity with
problems specific to their disciplines, departmental
or collegial review bodies offer the appellant the
best opportunity for a thorough and a fair review of
the appeal.

If an Arts student wishes to appeal a grade in a
course administered by a faculty other than Arts,
the student should attempt to work the matter out
informally with the course instructor. If the problem
cannot be resolved in this way, the student may
submit a formal written appeal to the Arts Faculty's Examinations and Standings Committee. The Committee will refer the appeal to the appropriate committee in the other faculty.

Students registered in faculties other than Arts who wish to appeal a grade in a course administered by the Arts Faculty should try to work the matter out informally with the instructor concerned. If the problem cannot be resolved in this way, a written appeal may be made to the Standings Committee of the student's faculty of registration. That committee will refer the appeal to the appropriate committee in Arts.

Whether or not a student wishes to proceed informally or formally, advice and assistance may be secured in the appeal either from the Undergraduate Office of the Faculty of Arts or from the officers of the Arts Student Union.

2. The review procedures adopted by departments and colleges in the Arts Faculty are critical. Departments and colleges must work out such procedures and have them easily available to anyone interested. When an appeal is made the department or college shall carefully discuss the procedures with the appellant to determine that they are clearly understood and acceptable to all parties. The review procedures used in a specific case, with any modifications agreed to should be signed by all parties to indicate they understand the procedures, and the procedures should then be ratified by the Arts Faculty Examinations and Standings Committee. The decision of the review committee and the reasons for the decision should be communicated in writing to the appellant. It is understood that the decision reached by the review committee on the substantive academic issues raised by the appeal is final and subject to change only under the following terms:

If an Arts student appeals beyond the department or college, he moves away from a pool of academic competence, and, in effect, formally requests a review of the procedures used in hearing his appeal. A written request should be submitted to the Arts Faculty Examinations and Standings Committee.

The Committee shall review the petition and transmit it with relevant documentation to the Arts Faculty Appeals Committee which shall comprise the Associate Dean (Undergraduate Affairs), a senior Professor appointed by the Arts Faculty Council Executive Committee, and a third or fourth year honours student designated by the Arts Student Union. The Arts Faculty Appeals Committee shall review the departmental or collegial procedures and shall have access to all relevant documents and the right to interview persons concerned. The main purpose of the Committee is to ascertain that decisions were reached using appropriate procedures and that both sides had adequate representation and a fair hearing. The decisions and the reasons for them shall be reported to both the appellant and the Examinations and Standings Committee.

Departmental Programs

Accounting

Students may earn a Bachelor of Arts degree in accounting in Honours Chartered Accountancy Studies or Honours Management Accountancy Studies.

The Honours Chartered Accountancy Studies or Honours Management Accountancy Studies programs (hereinafter referred to as Honours Accountancy Studies), permit students to meet the minimum course requirements for the CA and CMA certificates in a four-year honours program. In addition, the Honours Accountancy Studies programs can be used as a base from which to proceed to a Master of Accounting program which offers opportunities for both regular and professionally accredited graduate study. Students interested in professional accounting certification are advised to give careful consideration to completing the Professionally Accredited Stream in the Master of Accounting program (see below).

Recommended Program

<table>
<thead>
<tr>
<th>Term 1A</th>
<th>Term 1B</th>
<th>Term 2A</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACC 101</td>
<td>ACC 131</td>
<td>ACC 231</td>
</tr>
<tr>
<td>ECON 101</td>
<td>CS 100</td>
<td>ACC 281</td>
</tr>
<tr>
<td>MATH 113A*</td>
<td>ECON 102</td>
<td>ECON 201</td>
</tr>
<tr>
<td>ENGL elective (other than ENGL 109)</td>
<td>MATH 111B*</td>
<td>ECON 221</td>
</tr>
<tr>
<td>Two Group A or B electives</td>
<td>Two Group A or B electives</td>
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<td>ACC 291</td>
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<td>ECON 202</td>
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<td>PSYCH 101</td>
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<td>ACC 351</td>
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<td>ACC 371</td>
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<td>ACC 381</td>
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<td>ACC 392</td>
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<td>ACC 441</td>
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<td>ECON 341</td>
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<td>ACC 491</td>
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<th>Term 4B</th>
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<tbody>
<tr>
<td>ACC 401</td>
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<tr>
<td>ACC 462</td>
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<tr>
<td>Three electives</td>
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*Students who have not completed Grade 13 calculus will be required to take MATH 104 before taking
MATH 113A. Students who have not completed Grade 13 algebra may be required to complete MATH 103 before taking MATH 111B.

Honours Accountancy Studies – Regular Program
(Honours Chartered Accountancy Studies and Honours Management Accountancy Studies)

Students may apply for direct admission to Year One Regular Honours Accountancy Studies. Continued enrolment in these programs is limited, based on academic performance in terms 1A through 2D.

Eligibility for the degree of Bachelor of Arts in the Honours Accountancy Studies programs require:

1. Successful completion of a minimum of 42 term courses including the Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative average of at least 75% in all courses designated as required. In addition, students must have a minimum average of 70% in courses labelled accounting (ACC).

2. The following courses are required for both CA and CMA:
   a) ACC 101, 131, 231, 281, 291, 351, 371, 372, 381, 382, 392, 401, 441, 461, 462, 491;
   b) ECON 107, 108, 201, 202, 221;
   c) MATH 113, MATH 111B, and;
   d) either
      Specialization A – (Honours Chartered Accountancy Studies)
      ACC 132
      or
      Specialization B – (Honours Management Accountancy Studies)
      M SCI 211 or PSYCH 333

3. Those interested in qualifying as a Chartered Accountant should complete Honours Chartered Accountancy Studies by electing Specialization A above. At the end of this program the student will have completed all the formal university courses required at present by the Institute of Chartered Accountants of Ontario. The other principal requirement for qualification as a CA is a minimum of two years of work experience with a public accounting firm, passing of the Institute’s screening examinations, successful completion of the Institute’s School of Accountancy (offered in May-June by the Institute) and successful completion of the Uniform Final Examinations.

Those interested in qualifying as a Certified Management Accountant should complete Honours Management Accountancy Studies by electing Specialization B above. Of the 18 course requirements, students can presently qualify for 14 complete course and examination exemptions. Three others qualify as course exemptions (the examinations are written through the Society). The remaining course is offered and examined by the Society. The other principal requirement for qualification as a CMA is the completion of a minimum of two years of acceptable work experience.

Honours Accountancy Studies – Co-operative Program
(Honours Chartered Accountancy Studies and Honours Management Accountancy Studies)

Students may apply for direct admission to Year One Co-op Honours Accountancy Studies. Enrolment in this program is limited. If not admitted to the first year of the Co-operative program, students will be considered for admission to the Regular program and may apply for admission to a limited number of Co-op positions after completion of their first term of study. These students must contact the Undergraduate Officer by December 15 of the fall term in Year One.

There are five work terms available in the Co-operative program: students complete one or two 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 accounting settings in the public and private sectors. Because of the nature of the Honours Accountancy Studies Co-operative Program, which requires work experience, admission to this program requires Canadian Citizenship or Permanent Residence Status in Canada.

The academic requirements of the Co-operative program are the same as those of the regular Honours Accountancy Studies programs listed above.

Master of Accounting: Professionally Accredited Stream

The Professionally Accredited Stream (PAS) of the Master of Accounting (MAcc) program provides a complete and integrated program of professional accounting studies that qualifies students for special advanced standing towards professional certification. Students should be aware that the PAS is the final phase of an integrated sequence of accounting and related-area studies. Entrance to the PAS requires (in addition to meeting regular MAcc admission requirements) successful completion of the earlier phase of study (set out below). Students who complete the course work set out below, with a 75% average, and also meet the requirement of the Honours Accountancy Studies program will normally be eligible for entrance to the PAS in the MAcc program.
Because of restricted resources, the total number of students allowed to take the Year Three and Four studies set out above will be limited. Students interested in the Master of Accounting PAS should apply to the School of Accountancy prior to commencing their 3A term of studies for admission. Interested students are referred to the Graduate Calendar and the Graduate Officer of the School of Accountancy for further information on the PAS.

Special Recognition by the Accounting Profession of the MAcc Program, Professionally Accredited Stream

Students who complete the Professionally Accredited Stream of the MAcc program are prepared directly to write the Uniform Final Examinations of The Institute of Chartered Accountants (CA) and the Society of Management Accountants (CMA). This course of study 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 Exams which can be written at the first opportunity following graduation from the PAS of the MAcc program. Similarly, students receive maximum possible exemptions from the Society of Management Accountants. The course of study is unique in Ontario in that students are exempted from all but the three Final Accreditation Exams (FAE).

Transfer Students

Students in other programs at the University of Waterloo or elsewhere may apply to transfer to Honours Accountancy Studies and the PAS. To be eligible for admission to the pre-PAS program, students must have completed at least two years of university studies including the following courses:

Two term courses in Introductory Economics
One term course in each of:
  - Financial Accounting
  - Managerial Accounting
  - Statistics
  - Computing
  - Calculus (beyond Grade 13 or Ontario Academic Course in Ontario)

Algebra (beyond Grade 13 or Ontario Academic Course in Ontario)

Psychology or Sociology

English (other than ENGL 109)

Humanities elective (English, History, Philosophy or a foreign language)

Intermediate Macro or Microeconomics

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:
   a) 101, 201, 202, 260, 330;
   b) 102A or 102B;
   c) 103 or 263 or 290.

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, 201, 202, 260, 300, 330, 499A/B;
   b) 102A or 102B;
   c) 103 or 283 or 290;
   d) one additional 400-level term course.

Anthropology Joint Honours Program
Joint Honours programs have been approved for Anthropology and:

- Biology
- Classical Studies
- Drama and Theatre
- English
- French
- Geography
- German
- History
- Environment and Resource Studies
- Political Science
- Psychology
- Religious Studies
- 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, 201, 202, 260, 300, 330;
   b) 102A or 102B;
   c) 103 or 283 or 290;
   d) one 400-level term course.
   e) 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 either ANTH 102A or 102B. 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 page 8:12.
Year 2A
HIST 253X or P SCI 260A
ACC 121
Major Subject and Electives (three or four term courses).

Year 2B
HIST 254X or P SCI 260B; and PHIL 145
A Computer Science or approved Applied Studies course
Major Subject and Electives (three or four term courses).

Year 3A
Two approved courses in Applied Studies
Major Subject and Electives (four term courses).

Year 3B
An approved Applied Studies course
Major Subject and Electives (four term courses).

Year 4A
An approved Applied Studies course
Major Subject and Electives (four term courses).

Year 4B
An approved Applied Studies course
Major Subject and Electives (four 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. An Arts Administration specialization is available for qualified applicants at the beginning of the 2A term. Details in ML 119.

4. A list of approved Applied Studies courses is available from the Director of the program in ML 119.

5. 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 one term course 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 one term course at the 300 level. Normally not more than four of the 14 term courses may be in Latin or Greek.

Note
All CLAS courses and general programs were formerly designated C CIV.
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 page 8:12.

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/GRK 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 101A must be taken in the first term, and DRAMA 101B and 102 must be taken in the second term;
   b) any three of DRAMA 251, 252, 253, 254, 255, 258, 259, 301, 302, 351, 352, 353, 355, 356, 357, 358, 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) which would in effect become an area of specialization. The DRAMA 499 project in the fourth year would then presumably 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 101A must be taken in the first term, and DRAMA 101B and 102 must be taken in the second term;
   b) two of DRAMA 221, 222, 243, 244, 261, 262, 306, 307, 321, 322, 326, 327, 331, 332, 343, 344, 361, 362;
   c) six of DRAMA 251, 252, 253, 254, 255, 258, 259, 301, 302, 351, 352, 353, 355, 356, 357, 358, ENGL 362, 363;
   d) DRAMA 243, 244, 371, 372, 409, 499.

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 Honours requirements listed above. The Applied Studies requirements are listed on page 8:12.

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 101A must be taken in the first term, and DRAMA 101B and 102 must be taken in the second term;
   b) three of DRAMA 251, 252, 253, 254, 255, 258, 259, 301, 302, 351, 352, 353, 355, 356, 357, 358, ENGL 362, 363;
   c) DRAMA 243, 244, 371, 372, 409;
   d) DRAMA 499 or 2 other DRAMA courses may be taken if the other department of the Joint Honours program does not have a Senior Seminar. If the other department requires the equivalent of a Senior Seminar of its Joint Honours students the Drama Group would waive the 499 requirement, and the student would take two other Drama classes.

Minor Program
DRAMA 101A and 101B and DRAMA 102 plus seven other term courses of which two must be in dramatic literature.

Notes For All Programs
1. A student who has taken ENGL 362/363 may not also take ENGL 190.

2. The Drama program offers two courses in Speech Communication, DRAMA 223 and 224, to students in all faculties.
Economics

Prerequisite
It is desirable, but not mandatory, that students planning to enter Economics should offer a minimum of one Ontario Grade 13 credit in Mathematics 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 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 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 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, 221, 231, 301, 302, 321, 401, 402;
   b) 241 or 263.

c) Three additional term courses at the 300 level or above. (ECON 410 is recommended but not mandatory.)

Recommended Program

Year One
ECON 101, 102
Eight additional term courses*
*Students without Ontario Grade 13 Mathematics or equivalent should select MATH 103, 104 as an elective.

Year Two
ECON 201, 202, 231
Three additional term courses in Economics
Four additional term courses.

Year Three
ECON 301, 302, 321
Three additional term 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 page 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 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 18 term courses must be in Economics including ECON 101, 102, 201, 202, 211, 221, 231, 241, 263, 301, 302, 321, 401, 402, 403, 421, 422. In addition, students are required to complete one additional term course at the 300 level or above.
3. In addition, the following courses are required:
   a) MATH 111B, 113A
   b) ACC 121, 122
   c) CS 100 or 102.
Recommended Program for Honours Applied Economics (Co-op)

Year One
ECON 101, 102
ACC 121, 122
CS 100 or 102
ENGL 109 or 150
MATH 111
Three additional term courses.

Year Two A
ECON 201, 221, 231
MATH 113A
Two additional term courses.

Year Two B
ECON 202, 241
Four additional term courses.

Year Three A
ECON 263, 302, 321
Three additional term courses.

Year Three B
ECON 301, 410, 421
Three additional term courses.

Year Four A
ECON 401, 422
One additional term course in Economics at the 300 level or above
Two additional term courses.

Year Four B
ECON 402, 403
Three additional term courses.

Note:
Students enter Honours Applied Economics in term 2A but should apply in term 1B. See Co-op Advisor in Economics.

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.

Notes Regarding 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 211, 221. ECON 421, 422 to be included in the above core courses. 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 283 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:
   a) ECON 101, 102, 201, 202, 231;
   b) ECON 211 or 221.

Math students should substitute ECON 211 or ECON 221 with ECON 311 or 321.
English

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:
   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);
   e) one term course from 313, 314, 315, 316, 343, 344, 345, 346, 347, 415 (North American Literature);
   f) three other English major term courses.

Students in the General program must gain either a) a minimum of 16 term courses beyond the 100 level or b) credits from no more than seven subject fields.

Four-Year General English
Successful completion of a minimum of 40 term courses including Faculty of Arts Group requirements, with specific English requirements the same as for the Joint Honours Program. Students must maintain a minimum average of 70% in their English major courses and an overall cumulative average of 60%.

Honours English (Regular)
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:
   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 (Theory and Practice of Criticism - see Note 3);
   d) two term courses from 305A, 305B, 306A, 306B, 306C, 306D (Language and Early Literature);
   e) four term courses from 310A, 310B, 330A, 330B, 350A, 350B, 362, 363, 410A, 410B (British Literature to 1800);
   f) two term courses from 430A, 430B, 451A, 451B, 460A, 460B (British Literature since 1800);
   g) two term courses from 313, 314, 315, 316, 343, 344, 345, 346, 347, 415 (North American Literature);
   h) four other English major term courses (see Note 4).

Honours English (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 five paid 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. In addition, 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.

Students who complete the program will have had a total of 20 months of practical work experience for which they will have received payment. They will have been employed in areas in which they intend to pursue their careers. They will have had the opportunity to choose appropriate elective courses or groups of courses relevant to their careers. Finally, they will have qualified for a University of Waterloo Honours BA Degree in English.

Honours English (Applied Studies Co-op)
Students may combine an Honours English program with Applied Studies Co-op. The requirements in English are identical to the Honours requirements listed above. In addition, 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 page 8:12.
Rhetoric & Professional Writing Option

The Rhetoric and Professional Writing Program 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 total of 44 courses is required, and students must maintain an average of 75% in English courses, and 70% in their Intensive Study areas. 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, Linguistic Studies, 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 at 100 level or above (103A/B is recommended);
2. Literature: 200A/B; 251A/B; four further courses, at least two of which are at the 300 or 400 level;
3. Linguistics: 306A and one of 306B/C/D;
4. Writing: two of 209, 219, 210A/C; 309A/B; 409A/B;
5. Linguistics or Writing Option: two of 306B/C/D or English 309C/D.

Non-English Requirements (24 courses)
A Language other than English: minimum of two
Arts Group B requirements: minimum of two
Intensive Study area: minimum of five
Elective Areas: 11

English Joint Honours Program
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 major average of at least 70% (with no more than three term course grades below 72%) in the English component of the program, together with an average of at least 75% in both areas of specialization combined.

2. At least 18 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 (Theory and Practice of Criticism - see Note 3);
   d) two term courses from each of:
      i) 305A, 305B, 306A, 306B, 306C, 306D (Language and Early Literature);
      iii) 430A, 430B, 451A, 451B, 460A, 460B (British Literature since 1800);
      iv) 313, 314, 315, 316, 343, 344, 345, 346, 347, 415 (North American Literature);
   e) two other English major term courses (see Note 4).

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 program 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.

4. Students planning to go on to graduate work are advised to choose the following English courses:
   b) two term courses from 305A, 305B, 310A, 310B;
   c) two term courses from 330A, 330B, 350A, 350B;
   e) two term courses from 211, 212, 232, 233;
   f) 343;
   g) one term course from 313, 314, 315, 316;

5. Students planning to teach high school are advised to choose the following English courses:
   a) 102A, 102B, 200A, 200B, 251A, 251B, 362, 363;
   b) two term courses from 306A, 306B, 306C, 306D;
   c) two term courses from 305A, 305B, 310A, 310B;
   e) two term courses from 211, 212, 232, 233, 343, 344;
   f) two term courses from 313, 314, 315, 316, 415.

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**Fine Arts**

**Three-Year General Fine Arts**

Eligibility for graduation in the General Fine Arts program (Studio Option, Art History Option or Film Studies Option) 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 Options, the required courses are as follows:

   **Studio Option:**
   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 Option:**
   a) FINE 110, 111, and six additional Art History courses;
   b) Fine 120 and three additional Studio courses.

   **Film Studies Option:**
   a) FINE 110, 111, 250, 251, 350, 351 (or 360, 361), 470, 471, 490A, 270W (WLU);
   b) plus at least six term courses in Film Studies to be selected in consultation with the Fine Arts Film advisor. They may include FINE 252, 255R, 271W, 258W, 352, 353, 360, 361 (or 350, 351).

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**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 third year. 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 third year courses or are otherwise qualified.

Eligibility for graduation in the Honours Fine Arts program (Studio Option, Art History Option or Film 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 of at least 65%.

2. At least 20 term courses must be in Fine Arts. For the different Options, the required courses are as follows:
Studio Option:
a) FINE 110, 111, 120, 121, 220, 222, 224, 225;
b) six additional term courses in Fine Arts, four of which must be in Art History;
c) four term studio courses on the third year level chosen from: FINE 226, 324, 325, 320, 321, 322, 323;
d) FINE 490, 491.

Art History Option:
a) FINE 110, 111, 120, 121, 210, 211, 212, 213, 219, 316;
b) two additional term studio 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 Option:
a) FINE 110, 111;
b) two term courses chosen from Fine 120, 121, 210, 211;
c) FINE 250, 251, 270W, 350, 351, 360, 361, 470, 471;
d) at least five additional term courses in Film to be selected in consultation with the Fine Arts Film advisor. These may include FINE 252, 255R, 271W, 258W, 352, 353;
e) 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 identical to the Honours requirements listed above. The Applied Studies requirements are listed on page 8:12.

Joint Honours in Fine Arts
Joint Honours programs are possible in combination with a number of Departments within the Arts Faculty. Consult with the Fine Arts undergraduate advisor for details of this program.

Minor in Fine Arts (Studio, Art History or Film Studies Option)
Eligibility for graduation with a Fine Arts Minor (Studio, Art History or Film Studies Option) 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 Options, the required Fine Arts courses are:
   Studio or Art History Option:
   FINE 110/111, 120/121.
   Film Studies Option:

Note For All Programs
FINE 390, 391, 392, 393, 472 and 473 may be taken only as electives.

Fine Arts in France:
In the Spring, term courses in studio, art history and film studies will be offered in Paris and Burgundy. A selection from the following courses will be announced each year: Fine 220A, 226, 324, 330, 380, 381, 390, 420.

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 also have completed French 301 and 302 or equivalent.

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 eight must be at the 300 and 400 levels. Of the eight courses at the 300 and 400 level, two must be FR 401, 402. 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%.
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 one term course must be taken in each of the following areas: 17th, 18th, 19th, 20th century literature, French-Canadian literature, and either the Renaissance or the Medieval periods. The student must complete one course in linguistics and FR 402 or equivalent.

Recommended Program

Year One
FR 192 and/or FR 195/196.
Eight additional term courses.

Year Two
a) In language, a minimum of FR 251 plus one of FR 252, 207, 208 or 255.
b) A minimum of four additional term courses in French literature or linguistics.
c) Additional courses.

Year Three
a) In language, a minimum of FR 301/302.
b) A minimum of four additional term courses in French literature or linguistics.
c) Additional courses.

Year Four
a) In language, a minimum of FR 401/402.
b) A minimum of four additional term courses in French literature or linguistics.
c) Additional 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 Honours requirements listed above. The Applied Studies requirements are listed on page 8:12.

French Joint Honours Program
The Department of French recognizes combined honours programs with the following disciplines:

<table>
<thead>
<tr>
<th>Anthropology</th>
<th>Man-Environment Studies</th>
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<tbody>
<tr>
<td>Classical Studies</td>
<td>Mathematics</td>
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<td>Economics</td>
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<td>English</td>
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<td>Fine Arts</td>
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<td>Geography</td>
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<td>History</td>
<td>Sociology</td>
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<tr>
<td>Latin</td>
<td>Spanish</td>
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</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, including FR 402. At least one term course must be taken in each of the following areas: 17th, 18th, 19th, 20th century literature, French-Canadian literature, linguistics and either the Renaissance or the Medieval periods.

Recommended Program

Year One
FR 192 and/or FR 195/196.
Eight additional term courses.

Year Two
a) In language, a minimum of FR 251 plus one of FR 252, 207, 208, or 255.
b) A minimum of four additional term courses in French literature or linguistics.
c) Additional courses.

Year Three
a) In language, a minimum of FR 301/302.
b) A minimum of two additional term courses in French literature or linguistics.
c) Additional courses.

Year Four
a) In language, a minimum of FR 401/402.
b) A minimum of two additional term courses in French literature or linguistics.
c) Additional courses.

Minor Program in French
A minor program in French will consist of 10 term courses in French Language and/or Literature. Students must demonstrate written and oral ability in French equal to that expected in FR 301/302. FR151, 152, 155, 198 and 199 may not be counted as credits towards a French minor.

Notes for All Programs

1. Students in a Major or Honours program may count only one of FR 207, 208, 252, 255 in their French requirements, but may include several of these as elective credits.
2. Students who wish to major or honour in French are strongly urged to enrol in both FR 192A/B and FR 195/196.
Study in France or Quebec
The Department offers students in an honours program the possibility of studying for a year at the University of Nantes under a special third-year program. As well, students may study at the Université Laval in Quebec City. More information may be obtained from the 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 195, 200, 178, 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 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 65%.

2. At least 20 term courses in Geography which may include ENV S 195, 200, 178, 278, and must include five Regional Area term courses. Eligible courses are those listed under the heading Regional Geography (p. 10:20) plus GEOG 203.

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 75%.

Arts
Geography

2. At least 20 term courses in Geography which may include ENV S 195, 200, 178, 278, and must include five Regional Area term courses. Eligible courses are those listed under the heading Regional Geography (p. 10:20), plus GEOG 203.

Recommended 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

One of:
GEOG 125R Introduction to the Third World
GEOG 127 Regional Problems of Europe

Six electives which should include some Arts Faculty Group A requirements.

Year Two
GEOG 202 Location of Economic Activities
ENV S 176 Introduction to Environmental Research Methods

Two of:
GEOG 203 Regional Geography
GEOG 204 Soviet Union
GEOG 205 Africa
GEOG 220A The World Region I
GEOG 220B The World Region II
GEOG 221 U.S.A.

One of:
ENV S 200 Field Ecology
GEOG 201 Geomorphology and Soils
GEOG 208 Applied Climatology
GEOG 308 Physical Climatology

Five electives

Year Three
GEOG 381 The Nature of Geography
GEOG 390 Honours Thesis Proposal (Honours Only)
GEOG 391 Field Research (Honours Only)

Seven electives

Year Four
GEOG 490A/B Honours Thesis (Honours Only)

Eight electives

Geography Joint Honours
(See p. 10:18)

 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 (p. 16:49). ENGL 109, 128R, 140R or 150 may be taken in Year One; ENGL 209 or 210 may be taken in Year Two.

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, e.g. GEOG 391 (Field Research). 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. Students considering graduate work should take at least two term courses in a foreign language related to their field of interest.

5. Up to three term course equivalents may be taken as independent study courses in Geography.

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 151/152
Second Year
GER 251/252
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 80% 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 page 8.12.

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
Mathematics
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 80% and a cumulative major average of at least 75%.

2. At least 18 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:

a) not more than four term courses may be chosen from courses at the 100 level, and
b) 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 Semester (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 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.
4. Although students may take both GER 121/122 and GER 151/152, only one of these courses will normally count toward the Major or Honours requirement in German.

Greek
See Classical Studies.

Arts
Greek
History

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 16 term courses and two Senior Seminars must be in History. No more than two term courses may be at the 100 level. The Department of History’s Undergraduate Officer is responsible for ensuring that individual programs are not too narrowly specialized.
Recommended Program

Year One
Any first-year program that fulfills the Faculty of Arts requirements is acceptable. We recommend:

HIST 100
One of HIST 102A-U
Eight other term courses.

Year Two
Six term courses in History.
Six other term courses.

Year Three
Six term courses in History.
Four other term courses.

Year Four
Two Senior Seminars (2.0 course credits)
Two term courses in History.
Two other term courses.

Honours History (Applied Studies Co-op)
A student may combine an Honours History program with Applied Studies Co-op. The requirements in History are identical to the Joint Honours requirements listed below. The Applied Studies requirements are listed on page 6:12.

History Joint Honours Programs
Joint Honours programs are currently available between History and the following departments:

| Anthropology | German |
| Classical Studies | Philosophy |
| Drama | Political Science |
| Economics | Psychology |
| English | Religious Studies |
| Fine Arts | Russian |
| French | Spanish |
| Geography | Sociology |

Eligibility for graduation in the Joint Honours History 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 ten term courses and two Senior Seminars must be in History.

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’s Undergraduate Officer. They must maintain a 65% average in History courses.

Notes For All Programs
1. CLAS 251 and CLAS 252 will be accepted for credit as term courses in History provided that the student does not have credit for HIST 237 or HIST 238.

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 ten term course equivalents with an overall cumulative average of 65% or more in those credits. Students are required to take the following six term courses:

ITAL 101, 102, 191, 192, 251, 252

Four additional term courses must be chosen from any of the following courses:

ITAL 291, 292, 312, 391, 392, 396, 397

Note
Those students with Grade 13 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.
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 pursuance of a graduate degree.

The Medieval Studies program is administered jointly by the English Department at St. Jerome's College (Dr. D. Letson) and by the Department of Classical Studies (Dr. P. Forsyth). 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 four of the eight subject fields specified below.

3. Successful completion of at least six term courses (not all of which need be medieval in content) in one of the 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.


Honours Medieval Studies (Applied Studies Co-op)
A student may combine an Honours Medieval Studies program with Applied Studies Co-op. The requirements in Medieval Studies are identical to the Honours requirements listed above. The Applied Studies requirements are listed on page 9:12.

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, 251, 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.

Music Joint Honours Program
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) nine additional term courses of which at least six must be above the 100 level;
   e) 490A/B or a senior honours essay 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.

Arts
Philosophy

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, 241, 242, 243, or 440A/B;
   b) 221;
   c) any two of 380 - 387.

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, 241, 242, 243, or 440A/B;
   b) 218J or 221;
   c) any two of 380 - 387.

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 20 term courses must be in Philosophy, including PHIL:
   a) one of 241, 242, 243, or 440A/B;
   b) 221, 322, 499A/B;
   c) any four of 360 - 367.

St. Jerome’s Philosophy students must meet the basic requirements as listed above, and their PHIL courses must include:
   a) one of 241, 242, 243, or 440A/B;
   b) 218J or 221;
   c) 322;
   d) any four of 380 - 387;
   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 page 6:12.

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, 241, 242, 243, or 440A/B (depending on program);
   b) 221, 322;
   c) any four of 360 - 367;
   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.

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.

Arts
Philosophy
Political Science

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. P SCI 291 and 292 are non-program courses (see Note p. 0:32).

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

Year One
P SCI 101/102
Eight other term courses.

Year Two
Six term courses in Political Science (see Note)
Four other term courses.

Year Three
Six term courses in Political Science (see Note)
Four other term courses.

Year Four
Six term courses in Political Science at least four of which must be at the 400 level (see Note)
Four other term courses.

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, P SCI 260A/B, 331;
   b) one of P SCI 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 and Administrative 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 78% 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.
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 18 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 page 8:12. 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
- History
- Economics
- Man-Environment
- English
- Philosophy
- French
- Psychology
- Geography
- 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

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<th>Year One</th>
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P SCI 101/102
Two introductory term courses in the other discipline.
Six other term courses.

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<th>Year Two</th>
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Four term courses in P SCI (see Note)
Four term courses in the other discipline.
Four other term courses.

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<tr>
<th>Year Three</th>
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Four term courses in P SCI (see Note)
Four term courses in the other discipline.
Four other term courses.

Arts
Political Science
Psychology

Year Four
Four term courses in P SCI, 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:
- a) at least one term course in each of three different fields of the discipline;
- b) 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 P SCI 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 Faculty of Arts Group requirements with an overall cumulative average of at least 60% and a cumulative Psychology average of at least 65%.
2. At least ten term courses must be in Psychology, including PSYCH:
   - a) 101;
   - b) 200;
   - c) at least one of 203, 206, 207, 281, 271;
   - d) at least one of 211, 253, 355, 357;
   - e) at least one of 212, 213, 333, 334, 335, 341.
   - f) five electives in PSYCH.

Note:
PSYCH 291 plus 292 will be accepted as equivalent to PSYCH 200 in the General program.

Honours Psychology
Application for admission to the Honours Psychology program is normally made in March of first year. It is recommended that students seeking admission to Honours Psychology complete two term courses in Psychology in Year One. Selection for admission is based on both the Psychology and overall averages.
Eligibility for graduation in the Honours Psychology 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 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 p. 8:7 and Psychology Undergraduate Office).
   c) at least two of 203, 206, 207, 261, 271;
   d) at least two of 211, 253, 355, 357;
   e) at least two of 392, 393, 394, 395, 396, 397, 398;
   f) six PSYCH electives;
   g) PSYCH 499A/B.

   Students should consider prerequisites for third year courses when selecting their courses for second year. PSYCH 291, 292, 391, and two of the following courses: PSYCH 392, 393, 394, 395, 396, 397, 398 should be completed prior to the beginning of the fourth year of the program.

   It is also recommended that honours students take at least two senior seminars or special topics courses (at either the 300 or 400 level) in Psychology, from their PSYCH elective choices.

Recommended Program

Year One
PSYCH 101 and one PSYCH elective.
The equivalent of eight additional term courses.

Year Two
PSYCH 291/292
The equivalent of two additional term courses in Psychology.
The equivalent of six additional term courses.

Year Three
PSYCH 391
Two of PSYCH 392, 393, 394, 395, 396, 397, 398
The equivalent of three additional term courses in Psychology.
The equivalent of four additional term courses.

Year Four
PSYCH 499A/B.
Two senior seminars or special topics courses in Psychology.
The equivalent of two additional term courses in Psychology.
The equivalent of four additional term courses.

Honours Psychology (Applied Studies Co-op)
A student may combine an Honours Psychology program with Applied Studies Co-op. The requirements in Psychology are identical to the Honours requirements listed above except four PSYCH electives, rather than six, are required. The Applied Studies requirements are listed on page 8:12.

Honours Psychology Co-operative Program
The Department of Psychology offers a Co-operative Honours program in Psychology, in which academic studies are combined with relevant work experience. 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.

The Co-op program consists of six academic terms beyond the first year, and four paid work terms. Each work term is of four months duration. The program requirements are the same as listed for the Honours Psychology program. Additionally, 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.

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. However, interested students are advised to consult with the Co-op Faculty Advisor when planning their second-year programs.

Psychology Joint Honours Programs
Joint Honours programs exist with the following Departments:

- Anthropology
- Classical Studies
- Dance
- Drama
- Economics
- English
- Fine Arts
- French
- Geography
- German
- History
- Kinesiology
- Environment and Resource Studies
- Mathematics
- Music
- Philosophy
- Political Science
- Recreation
- Religious Studies
- Russian
- Social Development Studies
- Sociology
- Spanish
- Statistics
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 an overall cumulative average of at least 80%, 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.

At least 14 term courses in Psychology are required. An Honours Thesis is required but may be in either program (in Psychology-PSYCH 499A/B). The program requirements are as listed for the Honours Psychology program, except that four rather than six PSYCH electives are required. Students are advised that unless they elect to do their Honours Thesis in Psychology, their Psychology component would not be equivalent to the Honours program normally expected for admission to graduate programs in Psychology.

Early Childhood Education and Care Programs
The Department of Psychology offers both a Four-Year General and an Honours program with Early Childhood Education and Care Option. At the end of both programs, students will have completed all of the formal university training required by the Association of Early Childhood Education (Ontario), and the Ministry of Community and Social Services for working in a preschool and day care setting. The other principal requirement for the Early Childhood Education Certificate is one year of full-time teaching experience in the Ontario preschool setting. Interested persons are encouraged to consult the program handbook available from the Undergraduate Secretary before preregistering for second year. This brochure will assist you in making your decision between the General and Honours programs.

Four-Year General Psychology with Early Childhood Education and Care Option
Eligibility for graduation in the General Psychology program with Early Childhood Education and Care 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%, a cumulative Psychology average of at least 65%, and a grade of at least 75% in each graded Early Childhood Education course (PSYCH 322A/B, 341, 422A/B).
2. At least 20 term courses must be in Psychology for letter grades, including PSYCH: a) 101, 211, 212, 213, 291, 292, 311, 312, 322A/B, 341, 391, 392, 393, 422A/B, 453; b) 203 or 207; c) 499A/B.

Students are also required to take PSYCH 323A/B and 423A/B for credit. DANCE 264B is also required.

It is further recommended that students take at least two undergraduate seminars or special topics courses (300 or 400 level) in child psychology, from their PSYCH elective choices.

Students in General Psychology may apply for admission to the Early Childhood Education and Care Option during their second term of Year Two, to begin the program in Year Three. Applications are accepted during the March preregistration period until March 31st. Admission decisions will be made once grades are available for the Winter term. Students must have successfully completed PSYCH 101, 200, 203, 207, 211, 212, and 213, and have a minimum cumulative Psychology average of 65%. In addition, students must have had some previous experience working with children. Application forms and program handbooks may be obtained from the Undergraduate Secretary.

Honours Psychology with Early Childhood Education and Care Option
Eligibility for graduation in the Honours Psychology program with Early Childhood Education and Care 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%, a cumulative Psychology average of at least 75%, and a grade of at least 75% in each graded Early Childhood Education course (PSYCH 322A/B, 341, 422A/B).
2. At least 20 term courses must be in Psychology for letter grades, including PSYCH: a) 101, 211, 212, 213, 291, 292, 311, 312, 322A/B, 341, 391, 392, 393, 422A/B, 453; b) 203 or 207; c) 499A/B.

Students are also required to take PSYCH 323A/B and 423A/B for credit. DANCE 264B is also required.

In addition, it is recommended that students take at least one additional seminar or special topics course (300 or 400 level) in child psychology.

Students in Honours Psychology may apply for admission to the Early Childhood Education and Care Option during their second term of Year Two, to begin the program in Year Three. Applications are accepted during the March preregistration period until March 31st. Admission decisions will be made once grades are available for the Winter term. Students must have successfully completed PSYCH 101, 203 or 207, 211, 212, 213, 291, 292, and have a minimum cumulative Psychology average of 75%. In addition, students must have had some previous experience working with children. Application forms and program handbooks may be obtained from the Undergraduate Secretary.
Honours Psychology with a BSc Degree
An Honours Psychology degree program is also available in the Faculty of Science. See Chapter 14.

Minor Program in Psychology
Students choosing a Minor program in Psychology must successfully complete 10 term courses 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, 341;
- f) five PSYCH electives.
See the Undergraduate Secretary regarding the possible overlapping courses from your major program with PSYCH 200.

Religious Studies

Purpose of the Program in Religious Studies:
- a) 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;
- b) 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.
- c) to introduce them to the distinctive features of one or more religious tradition 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%.

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 65%.
2. At least 20 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) 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 page 8:12.
Religious Studies Joint Honours Program
The Religious Studies Department offers Joint Honours programs with the following Departments:

- Anthropology
- Classical Studies
- English
- Fine Arts
- French
- Germanic and Slavic Studies
- History
- Environment and Resource Studies
- Philosophy
- Psychology
- Social Development
- Studies
- Sociology

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 requirement 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
Requirements:
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 Literatures offers the following programs in 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

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 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 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
- French
- Geography
- German
- History
- Environment and Resource Studies
- 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:

a) not more than four term courses may be chosen from courses at the 100 level, and

b) 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 16.76.

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 interrelated 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 the Departments of the University, Renison or the other Colleges to serve 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 a number of 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 co-ordinator assists the students and the agencies to fulfill placement expectations.

The Social Development Studies program stands as a sound liberal and general education; however, it also provides an excellent background for further study in Social Work, Education, Religion, the Ministry, Journalism, and for work in various helping professions, community organizations, communications and international service organizations.

Major Courses

Listed below are courses from the four subject areas which combine in the Social Development Studies Major.

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<th>Interdisciplinary Social Science</th>
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<th>Psychology</th>
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<tr>
<td>ISS 320R</td>
<td>SOCWK 320R</td>
<td>SOC 327R</td>
<td>PSYCH 322R</td>
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<tr>
<td>350(A-L)</td>
<td>321R</td>
<td>328R</td>
<td>323R</td>
</tr>
<tr>
<td>398R</td>
<td>322R</td>
<td>367R</td>
<td>334(R)</td>
</tr>
<tr>
<td>398R</td>
<td>326R</td>
<td>368R</td>
<td>369R</td>
</tr>
<tr>
<td>495A/B</td>
<td>350(A-L)</td>
<td>369R</td>
<td>398R</td>
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<td>355R</td>
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<td>399R</td>
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</tbody>
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General Social Development Studies

Eligibility for graduation in the General Social Development 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 the Major with the following stipulations:

a) in the first year students must register in the Fall term for SOCWK 120R, PSYCH 120R, and ISS 150R. In the Winter term which follows, students must register in SOC 120R, ISS 131R and PSYCH 121R.

b) in the second year, all students are required to take ISS 250R and 251R.

c) four term course equivalents from the Major must be completed in each of the three years.

d) the 14 term course equivalents must be distributed over at least three of the four subject areas in the Major with a maximum of six term course equivalents within a single area counting towards the requirement.
Honours Social Development Studies
Eligibility for graduation in the Honours Social Development Studies 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 average of at least 75% in the Major.

2. At least 18 term course equivalents must be from the Major.

3. At least eight term courses must be taken that are related to a multidisciplinary theme area that has been selected in consideration of the students' own needs and plans. In consultation with Renison's Undergraduate Officer, courses are chosen which will explore a topic in depth.

Social Development Studies Joint Honours Program
Joint Honours programs are currently available with:

- English
- Music
- Philosophy
- Psychology
- Recreation
- Religious Studies
- Sociology

Eligibility for graduation in the Social Development Studies Joint Honours program typically includes fulfillment of the following requirements (variations may occur depending on the other discipline being considered):

1. Successful completion 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 Social Development Studies including:
   a) four term courses from ISS 131R, ISS 150R, PSYCH 120R, SOC 120R, SOC WK 120R;
   b) ISS 250R, 251R (Methodology);
   c) ISS 320R, plus five term course equivalents 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 must be completed (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, the College has developed a stream 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, the College's requirements for the Major and in addition include a range of courses particularly appropriate to the needs of such students (see details in Renison College calendar). Course selection should be made in consultation with Renison's Undergraduate Officer.

Diploma in Social Work
Students following the Social Work Stream within the Social Development Studies program may additionally apply at the end of Year One for admission to the Diploma in Social Work administered by the College. To qualify for the diploma, students must successfully complete 400 hours of supervised and evaluated field placement, attend seminars of the College, and in their final year write an essay synthesizing their field work with their studies.

Minor Program
A Minor in Social Development Studies consists of ten term courses which have been approved for the Major. 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 all Minors in Social Development Studies:

a) ISS 131R, ISS 150R, SOC WK 120R;
b) 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.

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 250R 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

General Sociology
Eligibility for graduation in the General Sociology 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 Sociology, including SOC:
   a) 101 (introductory course); 321 (sociological methods course);
   b) one of 305, 405, 406 (sociological theory).

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:
   a) 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 page 8:12.

Sociology Joint Honours Program
Sociology has Joint Honours programs with the following:

| Anthropology | Political Science |
| Economics | Psychology |
| English | Recreation and Leisure |
| French | Studies |
| Geography | Social Development |
| History | Studies |
| Mathematics | Spanish |
| Philosophy |

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 85% 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 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 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;
   c) two term courses are Survey of Spanish 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 page 8:12.

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 Spanish 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.
Faculty of Engineering
The Co-operative Engineering Program

The preparation for an engineering career includes both formal academic studies at a university and intensive training in the practice of engineering. A similar pattern is to be found in preparation for careers in medicine or law, and is characteristic of any development of professional competence. The Co-operative Engineering program at the University of Waterloo provides a completely integrated pattern of academic study and industrial experience in various phases of engineering with ultimate graduation requiring satisfactory performance in both areas. The degree program covers almost five calendar years, comprising eight terms each of about four months’ duration of university work on campus which are pursued alternately with six four-month terms of supervised training in the practical experiences fundamental to the development of the graduate engineer. The total time spent in study is the same as that encountered in the usual course of four “academic years.”

The engineering curricula at the University of Waterloo provide a sound basis in Mathematics and Pure Science and in Engineering Science and Design. The first year of the program is essentially common for all programs except Chemical and Systems Design Engineering. A substantial part of the work of the first and second years is common to all programs. Students elect one of the seven principal divisions of engineering starting with the first year. The curriculum for each of the seven basic programs combines required “core” subjects essential to the field, and “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 and promotions section of this chapter.

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
- Mechanical Engineering
- Systems Design Engineering

The Degrees of Master of Applied Science (MASc) and Doctor of Philosophy (PhD) are also awarded in Engineering. For further details, consult the Graduate Studies Calendar and the list of the particular courses in graduate work in the various departments.

Admission
All Year One students enrol in September. These Year One 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 a double academic term at the start of the program and the other having a double academic term 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 7-10.

The programs in Computer Engineering, Electrical Engineering, Geological Engineering and Systems Design Engineering are not divided into two groups. All Electrical Engineering and Systems Design Engineering students start with four months of school before going out on the first work term in the Winter. All Computer Engineering and Geological Engineering students start with eight months of school before their first work term.

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 must be: Relations and Functions, Calculus, Algebra, as well as Chemistry and Physics in their overall university-entrance level program. See the NOTE in the Admission Requirements chart in Chapter 2 for information about anticipated admission requirement changes. Applicants with high overall standing who are missing one of the five specific course requirements must contact the Admissions Officer 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 Grade 13 or Ontario Academic Course Mathematics and Science or their equivalent. The University has developed special pre-university mathematics and science courses which can be taken by correspondence and which are recommended for Adult Students. To discuss admissibility and appropriate qualifying work applicants are advised to contact the Admissions Officer for the Faculty of Engineering.
Admission to Advanced Standing
Because of 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.
3. Academic Decision Deferred - may not proceed until conditions cleared.
4. Required to Repeat Term - must stay out two terms before repeating.
5. 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.
6. Recommended for BASc Degree at (Spring/Fall) Convocation - program successfully completed.
7. 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, which may be reviewed by the Engineering Faculty Council. 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 a term 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 60% 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. Such students must satisfy the Faculty, before the beginning of the second succeeding academic term in the student's program, that their knowledge in these courses is sufficient. This may be done through one of the following, subject to the approval of the department in which the student is enrolled:
   a) A department may permit, at its discretion, a re-examination of certain of its courses in which the student received a grade of less than 50%, by either oral or written examination. Such re-examination will not affect the student's term average. There is a non-refundable re-examination fee of $25.00 for each such examination.
   b) The student may repeat those courses in which a grade of less than 50% was received and must achieve a grade of more than 50% in each such course. These grades will not affect the student's term average.
   c) The student may enrol in and take other courses as required by the Faculty or Department which may be equivalent to or replacements of the failed courses. The student must achieve a grade of at least 50% in each such course. These grades will not affect the student's term average.
A student who fails to satisfy these conditions may not proceed further in the program, and no student may obtain the B.A.Sc. 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 normally 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 a term 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 work load is maintained. In all cases, the program must be completed in no more than ten terms of full-time study.

7. IN 1A ONLY, students can Proceed on Probation if they achieve a term average of 50% or better with no more than two courses having a grade of less than 50%. If this is not the case, all other conditions apply.

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 in the term 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 Associate Chairman of the department. 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 for audit only.

12. Students who have successfully met all of the requirements of the program and have been recommended for the B.A.Sc degree will have First, Second, or Third Class Honours standing designated according to the cumulative 3A-4B average as follows:

<table>
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<tr>
<th>Class of Honours</th>
<th>Average</th>
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</thead>
<tbody>
<tr>
<td>First Class Honours</td>
<td>80-100%</td>
</tr>
<tr>
<td>Second Class Honours</td>
<td>70-79%</td>
</tr>
<tr>
<td>Third Class Honours</td>
<td>60-69%</td>
</tr>
</tbody>
</table>

13. Individual departments may designate additional minimum grade requirements in certain courses. Also, there are individual department rules regarding the grading and averaging of General 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>Numerical Equivalent</th>
</tr>
</thead>
<tbody>
<tr>
<td>A+</td>
<td>95</td>
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<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>
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<tr>
<td>D+</td>
<td>58</td>
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<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. Students who have reason to believe that a grade, term average, or academic decision is incorrect or unjust may launch an Appeal. Reasons in support of the appeal including medical certificates and similar documents must be submitted with the appeal. All appeals should be addressed to the Chairman of the Engineering Examinations and Promotions Committee, Registrar's Office, University of Waterloo. Appeals should be received prior to four weeks after the date of issue of the marks for the term in order to facilitate entry into the immediately following term if so desired by the student. Appeals which are launched later than six months after the end of the term being appealed will not be considered.

16. 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.

17. 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).

English Language Proficiency Requirements
All students with an initial registration in the Faculty of Engineering in the Fall 1986 term or later must satisfy the English Language Proficiency Requirement before graduation.

The English Language Proficiency Requirement may be satisfied by writing and obtaining a grade of 60% or better in the English Language Proficiency Examination (ELPE).

Students who obtain a grade of less than 50% in the ELPE must attend the Writing Clinic.

Students who have not obtained a grade of at least 60% in the ELPE by the beginning of the 2A term, must satisfy the Proficiency Requirement by taking an approved English course and obtaining a grade of 60% (C-), or better. The list of approved courses is maintained by the Director of General Studies of the Faculty of Engineering.

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 are considered unacceptable.

3. Work reports shall be 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-ordination.

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 the 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 with an "NCR" designation on any work report will not be promoted until they have cleared this condition. (See booklet titled Regulations & Procedures for Co-operative Programs.)

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, must, in the normal case, be in the top 5% of the class, and must, normally, attain a term average of at least 85%. This designation will be reflected on the student’s mark report and official university transcript.

Students with outstanding records throughout their undergraduate careers in Engineering will “Graduate on the Dean's Honours List” if their overall cumulative average for the last six terms of the program is at least 85% and if they have completed at least two work-term reports which have been graded as "Outstanding". 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.

Options and Electives in Engineering

Each of the Engineering Undergraduate Programs consists of three course groupings:

1. The compulsory core program within the department which prepares the student for practice in the particular branch of engineering and comprises 70 to 80 percent of the course load.

2. Technical elective course groupings designed to give some depth in a particular technical discipline appropriate to the branch of engineering and comprising 10 to 20 percent of the course load. These technical elective course groupings are usually structured within a department, but some groups are available across the Faculty.

3. General Studies course groupings outside the engineering and physical sciences and mathematics, chosen to give some breadth of studies related to a graduate's role as an educated professional in society. A minimum of five one term courses is required by all branches of engineering.

In both the technical elective and general studies course groupings, the students with special interests may, with the approval of their department Associate Chairman, structure individual option course 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 will be pre-scheduled to ensure that courses in the group will not conflict with core courses.

Certain optional course groupings have been recognized by the Faculty of Engineering at 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 they are:

- Option in Mathematics . . . . . . . (Faculty Option)
- Option in Physics . . . . . . . (Faculty Option)
- Option in Computer Engineering . . . (Faculty Option)
- An Option in Statistics is in the approval process . . . . . . . (Faculty Option)
- Management Sciences Option . . . (Faculty Option)
- Society, Technology and Values Option . . (University Option)

Because designated options can require up to eight courses, it may be necessary for students in some departments to take extra courses to complete the required work in some options.

For a designation to appear on the transcript a student must achieve an average of 60% on the Option courses and a grade of 56% on each of the courses in the option.

Many departments of the University offer "MINORS" in their discipline. 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 general studies courses groups. Students interested in a Minor should:

1. Determine the requirements for the Minor from the University calendar and their eligibility to fulfill the requirements from the Department offering the Minor.

2. Determine if any of the courses can be counted toward requirements of the engineering program by checking with the Associate Chairman of the student’s department.
3. Obtain approval for a program including the Minor, from their Undergraduate Associate Chairman. 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.

Current Option Packages Available are:

1. DESIGNATED TECHNICAL OPTIONS IN THE FACULTY

a) 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 Calculus 2 (or equivalent)
- MATH 212 Advanced Calculus (or equivalent)
- MATH 234A Linear Algebra 2
- MATH 234B Abstract Algebra 1
- EL E 316 Probability and Statistics (or equivalent)
- PMATH 331 Real Variables or MATH 332B Complex Variables

A student must additionally take two courses from the following, subject to availability and time-table constraints.
- PMATH 334 Abstract Algebra 2
- PMATH 340 Elementary Number Theory
- PMATH 360 Geometry
- PMATH 365 Differential Geometry and Tensor Analysis
- PMATH 367 Set Theory and General Topology
- AM/PMATH380A Introduction to Information Theory
- AM/PMATH 380B Information Theory with Applications
- PMATH 430A Introduction to Mathematical Logic
- PMATH 430B Introduction to Mathematical Logic
- AM 365 Introduction to Continuum Mechanics
- AM 371 Partial Differential Equations
- AM 381 Ordinary Differential Equations
- AM 395 Mechanics
- MATH 332B Complex Variables or PMATH 331 Real Variables
- 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 Professor I.F. Blake, Department of Electrical Engineering.

b) 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.

There are five required courses:
- PHYS 115 Mechanics
- PHYS 125 Physics for Engineers
- PHYS 263 Classical Mechanics and Special Relativity
- PHYS 354 Atomic and Molecular Physics
- M E 250 Thermodynamics (or equivalent) or PHYS 358

A student must additionally take three electives from Group A or three electives from Group B, subject to availability and time-table constraints.

Group A
- PHYS 259 Crystallography & 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 & Particle Physics

Group B
- PHYS 350 Astrophysics 1
- PHYS 364 Mathematical Physics 1
- PHYS 365 Mathematical Physics 2
- AM 372 Introduction to General Relativity
- PHYS 445 Modern Optics
- PHYS 449 Radio Astronomy
- PHYS 451 Astrophysics 4

The list of courses in Groups A and B will be subject to change from time to time. For further information contact Professor S.K. Chaudhuri, Department of Electrical Engineering.
c) Option in Computer Engineering
This is a Designated Faculty Option which is available to students in Electrical Engineering and Systems Design Engineering to give them greater training in software and to augment their digital hardware capabilities. For details of this option students are referred to the Electrical Engineering and Systems Design sections of the calendar.

d) Option in Statistics
An option in Statistics, similar in structure to the option in Mathematics, is in the approval process. Interested students should consult with their Undergraduate Associate Chairman for current information or contact Professor K.S. Brown of the Department of Statistics and Actuarial Science.

2. NON-DESIGNATED TECHNICAL OPTION GROUPINGS
Technical options are developed and administered by the various departments for students in their departmental programs. Students are referred to the technical option listings in their home departments. Students with special interests who may wish to develop a self-planned technical option, which is interdepartmental, should consult with their department Associate Chairman.

3. DESIGNATED "MIXED" OPTIONS IN THE FACULTY
a) 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 general studies courses. The option is available in all engineering programs except Geological Engineering. 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 I
M SCI 331 Operations Research I
M SCI 211 Organizational Behaviour I (General Studies Course)

plus three of the following or equivalent:
M SCI 311 Organizational Behaviour II (General Studies Course)
M SCI 431 Operations in Research II
M SCI 432 Introduction to Production
M SCI 452 Behavioural Decision Analysis

M SCI 461 Managerial and Engineering Economics II

For further information see the Management Sciences section in this chapter of the calendar or contact the Associate Chairman of the Management Sciences Department.

b) Option in French Studies
An eight-course designated option in French Studies is in the process of being developed for engineering students. If approved, the completion of this option would also fulfill the General Studies requirements. The option would be for students with Ontario Grade 13 standing in French who wish to continue French studies to the level of bilingualism required for government service, as well as acquiring some background in the culture and literature of French Canada. The option would require at least three extra courses above the requirements of an engineering program. For further information contact the Director of General Studies, in the Faculty of Engineering Associate Dean's Office.

4. DESIGNATED GENERAL STUDIES OPTION

Option in Society, Technology and Values (This is a University Option, open to all students in UW)
What impact do modern technologies have on society's well-being? How can we guide technology so that it contributes to human betterment? What values should shape the direction and pace of technological change? These and other crucial questions are explored in the UW undergraduate Option in Society, Technology and Values (STV). The Option provides students with an opportunity to examine a wide range of issues centering on the human context of science and technology.

The option consists of six courses:

STV 100 Society, Technology and Values, Introduction
STV 200 Project Course
STV 400 Senior Project

plus: three theme area courses taken after STV 100. Theme packages are regular offerings of various UW departments. Theme areas currently available are:

- Value and Ethics
- Technological Issues in War and Peace
- History of Technology
- Impact Assessment Studies
- Economic and Management Issues (The Engineering course on Engineering Economics is part of this package.)
- Technology and Artistic Expression
For example, a theme area grouping for engineers could be:
1. The core course on Engineering Economics.
2. GEN E 351 Information Technology and Society.
3. GEN E 412 (Crosslisted as PHIL 315) Ethics and the Engineering Profession.

A complete list of courses in theme areas and other information is available from the Centre for Society, Technology and Values (E.S.I., Rm. 301, ext. 6215) or contact the Director of General Studies, Faculty of Engineering in the Associate Dean's Office. The three required courses in this option are scheduled so as not to conflict with engineering core courses. Students who take this option will meet the General Studies requirement of their program.

5. NON-DERIGNATED GENERAL STUDIES OPTIONS
(These options meet the General Studies requirement of students' programs but are not designated on their transcripts.)

a) Self-Planned General Studies Option
A student may plan an individual general studies option provided it meets these general criteria:
1. It should consist of five courses which are clearly not engineering, mathematics or other closely related subjects.
2. It should include courses beyond the introductory level.
3. It is chosen from a University-wide master list of courses approved for engineering students. (Department Undergraduate Associate Chairmen have the list.)
4. The choice of courses is approved by the Associate Chairman of the student's department.

Students who plan their own option package may have considerable difficulty with timetable conflicts.

b) Humanities and Social Sciences Option
This option 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 option, most of which are prescheduled so as not to conflict with the engineering core programs.

Students are required 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 must include at least two courses beyond the introductory level.

In the following:
(I) Indicates introductory level. F fall, W winter, S spring.
(P) Indicates courses which will be scheduled into 11:30-12:30MWF or 7:00-10:00M or 7:00-10:00T.

The choices are:

Social Sciences-based Courses
(P) Economics: (I) ECON 101(F,W,S); ECON 201(F,W,S)
(P) Management: (I) M.SCI 211(F,W,S); M.SCI 311(F,W); M.SCI 461(F,W); GEN E 352(W)
(P) Political Science: (I) P.SCI 102M(W,S); P.SCI 200A(F); P.SCI 200B(W,S)
(P) Psychology: (I) PSYCH 101(F,S,W); PSYCH 253(F,W)
(P) Sociology: (I) SOC 101(F,W); SOC 265(F,W)

Other social sciences-based courses are permissible but will not be prescheduled. See department Associate Chairman for the approved list.

Humanities-based Courses
(P) English (I) 105A(F,W,S); 214(F,W,S)
(P) French (I) 195(F); (I) 196(W); 275(F); 232(W,S); 253(W,S)
(P) History: (I) 130(F,W,S); 253(F); 254(W,S)
(P) Philosophy: (I) 200A(F,S); 200B(W); 300X(W); 315(W) (GEN E 412)
(P) General Engineering: GEN E 351(F,W); GEN E 411(F,S); GEN E 412(W) (PHIL 315)

Other courses in these and the following humanities-based areas are permissible but will not be prescheduled so may present timetable conflict problems. (Anthropology, Canadian Studies, Classical Studies, Fine Arts, Greek, Latin, Music, Peace and Conflict Studies, Religious Studies).

See department Associate Chairman for the approved list.

c) Other Prescheduled General Studies Option Groupings
Other option groupings which would be conflict-free are being considered in the areas of Health and Bio-medical Studies, Business Studies and Environmental Studies. Interested students are advised to check with their department Associate Chairman or the Director of General Studies of the Faculty of Engineering.
Combined Bachelor's - Master's Program In Engineering

I. INTRODUCTION
The Faculty of Engineering offers a combined Bachelor's - Masters' 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.

II. 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 contrast 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:

A) 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:

1. 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;
2. the graduate program must include at least four (graduate) courses and a thesis, or eight courses and a MASc project.
3. the Co-operative work-term requirements of the BASc program must be met.

B) There must be complete freedom of transferability from the combined programs to the regular programs.

C) 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 even if circumstances so warrant, to withdraw from the University.

D) 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.

E) A combined program normally functions on the Co-operative basis.

F) 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.

III. ORGANIZATIONAL STRUCTURE FOR THE COMBINED BACHELOR'S - MASTER'S PROGRAM

A) 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.
1. 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 Chairmen for Undergraduate and Graduate Studies.

B) Course Programs
The courses chosen by the student (with the advice of the Supervisor and approval of the Associate Chairman) 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 Chairman).

C) 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.

D) 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.

E) 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.

F) 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 FOE scholarships during the 5A and 5B terms.

G) 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 thereafter 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.
Year One Engineering Programs

All students enrolling in Year One are required to choose one of the following programs:

a) Chemical Engineering
b) Civil Engineering
c) Computer Engineering
d) Electrical Engineering
e) Geological Engineering
f) Mechanical Engineering
g) Systems Design Engineering

Students enrolling in a Year One Engineering program (other than Chemical and Systems Design) must register in the courses indicated in the following table: (Course descriptions can be found in Chapter 16).

**Term 1A**
- MATH 110A
- MATH 114
- CH E 102
- PHYS 115
- GEN E 115

**Term 1B**
- MATH 110B
- PHYS 125
- GEN E 121
- GEN E 123*  
- One technical option from the following:
  - CIV E 126
  - EL E 126
  - GEO E 126
  - M E 126
  - One General Studies elective (to be chosen from the list of recommended courses which will be published each year)***

*Computer Engineering students must take EL E 123 in lieu of GEN E 123.
*Electrical Engineering students must take EL E 123 in lieu of GEN E 123.
*Mechanical Engineering students must take GEN E 124 in lieu of GEN E 123.
**Students who wish to take the Management Sciences Option package in upper years should choose a course from the Humanities in Term 1B.

Students enrolling in Chemical Engineering register for the same courses as above except in the 1A term they take CH E 100 in lieu of GEN E 115, and CH E 101 in lieu of one of the above technical options in the 1B term.

Transfer between programs is possible. Interested students should consult with the staff of the Engineering section of the Registrar’s Office.

Chemical Engineering

The basic objective of the undergraduate program is to provide the student with an education appropriate for a career in the chemical industry, or for future studies in Science or Engineering, or other professions such as Medicine, Law, or Business. To be most effective in a rapidly changing technological age, the program deals primarily with scientific and engineering principles. In the early years chemistry, physics and mathematics form the foundations. In the senior years, subjects such as economic analysis and pollution control enable the student to reach a more relevant understanding of the earlier studies. Specialization is available through the following six elective course packages in 4B.

**Transport Process**
This elective package is a further development of a core area of chemical engineering. Within it, aspects of fluid flow, heat transfer, mass transfer and reaction kinetics, which are important in most chemical and allied industries, are studied.

**Mathematical Analysis and Control**
This elective package also deals with the further development of a core area of chemical engineering. It involves studies in optimal control, economic and process optimization, and simulation.

**Polymer Science and Engineering**
This elective package 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. At present, a significant per cent of the Ontario chemical industry is directed to polymers (plastics, elastomers, synthetic fibres).

**Extractive and Process Metallurgy**
This elective package 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 and Food Engineering**
This elective package deals with the application of chemical engineering principles to biotechnology, with emphasis on bioprocesses. Examples are fermentation operations, biofuels, food processing, and waste treatment and utilization, using either microbial cell or enzyme systems. The usefulness of these studies is obvious in a world with increasing food and health problems, and for the Canadian economy in which agricultural products play a significant role.
Pollution Control Engineering
This elective package presents aspects of waste treatment and pollution abatement techniques which are becoming increasingly important for the proper function of technology in a quality-conscious society.

Academic Program
The following program is the result of a recent curriculum revision and applies to students who entered in 1985 or later. Students who entered before 1985 should consult the Associate Chairman for Undergraduate Studies for their appropriate program.

Term 1A, Fall
CH E 007 General Awareness Seminar
CH E 100 Chemical Engineering Concepts 1
CH E 102 Chemistry for Engineers
MATH 110A Calculus 1A
MATH 114 Algebra and Vector Geometry
PHYS 115 Mechanics

Term 1B, Winter and Spring
CH E 007 General Awareness Seminar
CH E 101 Chemical Engineering Concepts 2
GEN E 121 Digital Computation
GEN E 123 Electrical Engineering
MATH 110B Calculus 1B
PHYS 125 Physics for Engineers
General Studies Elective

Term 2A, Fall and Winter
CH E 007 General Awareness Seminar
CH E 021 Transport Processes 1
CH E 022 Applied Mathematics 1
CH E 023 Physical Chemistry 1
CHEM 026 Organic Chemistry 1
MATH 210 Calculus 2

Term 2B, Winter and Spring
CH E 007 General Awareness Seminar
CH E 025 Transport Processes 2
CH E 026 Physical Chemistry 2
CHEM 036 Organic Chemistry 2
ENGL 210C Report Writing
MATH 216 Differential Equations

Term 3A, Winter and Spring
CH E 007 General Awareness Seminar
CH E 030 Transport Processes 3
CH E 031 Process Flowsheeting
CH E 032 Introductory Biotechnology
CH E 033 Chemical Engineering Thermodynamics
CH E 034 Inorganic Process Principles 1

Term 3B, Fall and Winter
CH E 007 General Awareness Seminar
CH E 035 Transport Processes 4
CH E 036 Chemical Reaction Engineering
CH E 037 Applied Mathematics 2
CH E 038 Inorganic Process Principles 2
General Studies Elective

Term 4A, Spring and Fall
CH E 007 General Awareness Seminar
CH E 040 Chemical Engineering Unit Operations Laboratory
CH E 041 Introduction to Process Control
CH E 042 or CH E 043 Project 1
CH E 044 Economics for Chemical Engineering
GEN E 411 Engineering Law

Term 4B, Winter
CHE 007 General Awareness Seminar
CH E 047 or CH E 048 Project 2
General Studies Elective
Technical Elective 1
Technical Elective 2
Technical Elective 3

General Studies Courses
For students in the regular program, the minimum requirement is five general studies courses which satisfy the General Studies Program requirements on page 96 and may include ENGL 210C and GEN E 411. Variation from these requirements requires the approval of the Associate Chairman for Undergraduate Studies. Students who complete the general studies requirement early (through extra courses, correspondence courses or transfer credits) may be allowed to substitute technical electives for General Studies electives with the approval of the Associate Chairman for Undergraduate Studies.

4A-4B Project Course
All students are required to complete a design or research project in 4A and 4B working either in a group (CH E 042 and CH E 047) or individually (CH E 043 and CH E 048).

Technical Electives
All students are required to complete one of the six elective packages described above. Each package consists of two 500-level courses in 4B. Courses from outside the department must be approved by the Associate Chairman for Undergraduate Studies.

1) Transport Processes
CH E 512 Separation Processes
CH E 514 Fundamentals of Petroleum Production
2) Mathematical Analysis and Control
CH E 522 Advanced Process Dynamics and Control
CH E 524 Process Control Laboratory
3) Polymer Science and Engineering
CH E 542 Polymerization and Polymer Properties
   (double course weight)
4) Extractive and Process Metallurgy
CH E 552 Extractive Metallurgy 1
CH E 554 Extractive Metallurgy 2
5) Biochemical and Food Engineering
CH E 562 Fermentation Engineering
CH E 564 Food Process Engineering
6) Pollution Control Engineering
CH E 572 Air Pollution Control
CH E 574 Treatment of Aqueous Inorganic Wastes

Option in Management Sciences
The Option in Management Sciences is described in detail starting on page 9:23. A student may acquire a B.A.Sc. in Chemical Engineering with an Option in Management Sciences by taking seven specified M SCI courses, two of which are part of the CH E core (CH E 022 and CH E 044). Of the five other courses, four may be taken in place of ENGL 210C in 2B, GEN E 411 in 4A, the general studies elective in 3B, and the third technical elective in 4B. The remaining course must be taken as an extra.

Note:
Grades for extra courses are recorded but not included in determining the term average or class ranking.

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, and therefore specialized programs in each of the following Options can be offered.

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.

Water and Waste Management Engineering
Addresses water and wastewater treatment, surface and groundwater pollution and 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.
### 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
An option intended to provide the student interested in structural engineering, mechanics or properties of materials with a background in materials science.

### Additional Programs
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 Chairman 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.

Vocationaly 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.

### A) Core Program

#### a) Credit Courses
- CIV E 125 Civil Engineering Concepts
- 203 Statics
- 204 Mechanics of Solids 1
- 205 Mechanics of Solids 2
- 221 Calculus 2
- 222 Differential Equations
- 223A Computer Workshop A
- 223B Computer Workshop B
- 224 Probability and Statistics
- 253 Geology for Engineers
- 265 Structure and Properties of Materials
- 280 Fluid Mechanics and Thermal Sciences
- 291 Survey Camp
- 292 Engineering Economics
- 300 Civil Engineering Project 1
- 303* Structural Analysis 1
- 342* Transport Principles and Applications
- 353* Geotechnical Engineering 1
- 375* Water Quality Engineering
- 400 Civil Engineering Project 2
- 491 Engineering Law

Plus one of:
- CIV E 313 Structural Concrete Design 1
- CIV E 413 Structural Steel Design

*In the 3A term one of CIV E 303, 342, 353, or 375 may be delayed to a later term but must be taken before graduation. This would allow the student to take a course prerequisite to senior courses in a non-Civil Engineering option program. The permission of the Associate Chairman for Undergraduate Studies is required.

#### b) Non-Credit Courses
- CIV E 298 Civil Engineering Seminars
- CIV E 299 Civil Engineering Seminars
- CIV E 398 Civil Engineering Seminars
- CIV E 399 Civil Engineering Seminars
- CIV E 498 Civil Engineering Seminars
- CIV E 499 Civil Engineering Seminars

### 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.
B) 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
- Design and Synthesis
- Humanities and Social Sciences

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.

CIV E 306 Mechanics of Solids 3
313 Structural Concrete Design 1
343 Traffic Engineering
344 Urban Transport Planning
354 Geotechnical Engineering 2
381 Hydraulics
401 Civil Engineering Project 3
403 Structural Analysis 2
404 Structural Analysis 3
406 Structural Dynamics
407 Building Science & Technology
413 Structural Steel Design
414 Structural Concrete Design 2
415 Structural Systems
422 Finite Element Analysis
430 Experimental Mechanics
440 Transport Systems Analysis
442 Pavement Structural Design
454 Geotechnical Engineering 3
460 Orthopaedic-Bioengineering
472 Waste Water Treatment
473 Contaminant Transport
480 Water Resources Management
486 Hydrology
493 Engineering in the Canadian North
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) Social Sciences and Humanities Electives
Five courses in non-technical subjects, including the General 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 General Studies in the Faculty of Engineering.

C) Academic Program for Each Term

Term 1A (Fall)
MATH 110A, MATH 114, CH E 102, PHYS 115, GEN E 115

Term 1B (Winter and Spring)
MATH 110B, PHYS 125, GEN E 121, GEN E 123, CIV E 126, one Social Sciences or Humanities elective. (Students who wish to take the Management Sciences Option package in upper years should choose a course from Humanities.)

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 social sciences or humanities elective, CIV E 291 +

Term 3A (Winter and Spring)
CIV E 300, CIV E 303*, CIV E 342*, CIV E 353*, CIV E 375*, CIV E 396, one social sciences or humanities elective. Any one of the courses marked with * may be delayed to another term but must be taken before graduation and must be replaced with another technical course approved by the Assoc. Chairman. (Delaying such a course 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 social sciences or humanities 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. One social sciences or humanities elective to be taken in either 4A or 4B term; 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; one social sciences and humanities elective, unless the required program is completed by the 4A term. A total of 11 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.
Civil Engineering with an Option in Management Sciences
A student may acquire a B.A.Sc. in Civil Engineering with an Option in Management Sciences by taking 8 M SCI courses as electives. These courses are specified in this Calendar in the section "Engineering - Management Sciences". Note that M SCI 251 and M SCI 261 are equivalent to CIV E 224 and CIV E 292 respectively, for the purposes of this Option. The student must achieve a grade of at least 50% in each of the 8 courses and must obtain a cumulative average of 60% or more in these courses. A student who wishes to follow the Management Sciences Option must declare his or her intent before embarking on the 2R term and must obtain the approval of the Civil Engineering Department.

Computer Engineering
The Computer Engineering program is controlled and administered by the Department of Electrical Engineering.

Computer Engineering is a branch of engineering that deals with the design and development 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 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 the fourth year the students must take a minimum of eight technical courses. Seven of these are selected as set out below in the section on Technical Electives.

In addition, students must satisfy Faculty of Engineering general studies requirements by choosing suitable elective courses.

The normal recommended program shown below involves a course load (excluding seminars) of five or six courses per term. Laboratory exercises are compulsory where they form part of a course. 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 9:3).

Students must register their course load at the start of each term. Departmental permission at the time of registration will be required for departures from the normal load in any one term.

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 9:3).

General Studies Electives
Five courses, including the general studies course in the 1B term, must satisfy the General Studies Program described on page 9:6. GEN E 351 "Information, Technology and Society" is recommended for all students.

Options in Computer Engineering
The normal Computer Engineering program shown has been designed to offer a well balanced and rewarding education. Students wishing to enrich their education 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 9:23) designed for those students with an interest in the management of technology. Further details are made available at the beginning of the 2A term.

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 9:7) designed to give students a broad background in either pure or applied mathematics. Further details are made available during the 1B term.

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 9:7) designed to give students an enriched background in the fundamentals of physical science. Further details are made available during the 2A term.

The successful completion of these courses results in a designation on the transcript "Option in Physics."
ACADEMIC PROGRAM 1987/88

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 9:12.

<table>
<thead>
<tr>
<th>Term 1B, Winter Course</th>
<th>No.</th>
<th>Name</th>
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<tr>
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<td></td>
<td>MATH 110B Calculus 1B</td>
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<td></td>
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<td>GEN E 121 Digital Computation</td>
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<td>EL E 123 Electrical Engineering</td>
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<td></td>
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<td>EL E 126 Electricity &amp; Magnetism</td>
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<td></td>
<td></td>
<td>EL E 201 Seminar</td>
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<td>MATH 211 Advanced Calculus for (EL E 205) Electrical Engineers 1</td>
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<td></td>
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<td>EL E 222 Digital Computers</td>
<td>3</td>
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<td>EL E 234 Microelectronic Circuits &amp; Devices I</td>
<td>3</td>
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<td></td>
<td></td>
<td>EL E 251 Programming Languages &amp; Translators</td>
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<td></td>
<td>M SCI 261 Managerial and Engineering Economics 1</td>
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<th>Term 2B, Spring Course</th>
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<td>EL E 202 Seminar</td>
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<td>MATH 212 Advanced Calculus for (EL E 206) Electrical Engineers 2</td>
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<td></td>
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<td>EL E 224 Numerical Methods</td>
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<td>EL E 252 Data Structures</td>
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<td>EL E 323 Digital Circuits &amp; Systems</td>
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<tr>
<th>Term 3A, Winter Course</th>
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<td>EL E 301 Seminar</td>
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<td>EL E 316 Probability and Statistics</td>
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<td>EL E 333 Microelectronic Circuits &amp; Devices II</td>
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<td>EL E 342 Electrical Networks</td>
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<td>EL E 353 Microprocessor Systems and Interfacing</td>
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<td>EL E 354 Real-time Operating Systems</td>
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Engineering
Computer Engineering

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<th>Term 3B, Fall Course</th>
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<td></td>
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<td>EL E 302 Seminar</td>
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<td>EL E 318 Communications Systems</td>
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<td></td>
<td>EL E 360 Electromagnetic Devices</td>
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<td></td>
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<td>EL E 380 Systems and Control</td>
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<tr>
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<td>EL E 427 Digital Systems</td>
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<td>General Studies Elective</td>
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<thead>
<tr>
<th>Term 4A, Spring Course</th>
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<td></td>
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<td>EL E 401 Seminar</td>
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<td></td>
<td></td>
<td>EL E 455 Database Systems</td>
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<td></td>
<td>3 Elective Area Courses</td>
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<td>General Studies Elective**</td>
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<th>Term 4B, Winter (Not Offered 1987-88) Course</th>
<th>No.</th>
<th>Name</th>
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<tr>
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<td>EL E 402 Seminar</td>
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<td>3 Elective Area Courses</td>
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<td>Technical Elective</td>
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<td></td>
<td></td>
<td>General Studies Elective**</td>
<td>3</td>
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</tbody>
</table>

*Indicates laboratory every second, every third week, or open lab. See Course Descriptions.

**Of the two General Studies Electives taken in fourth year, at least one must be a 2nd level course or higher. Students taking courses from group C in the program need the approval of the Undergraduate Officer.

Technical Electives in Computer Engineering
A minimum of seven technical electives must be taken during the last two terms. Of these seven courses, six must belong to an elective area. This is a sequence of courses in which the students will be exposed to a significant engineering application of computers and in which they will learn, through coursework and actual design experience, how the engineering, hardware and software fundamentals are brought to bear on and are integrated with the needs of an application.

The Department maintains a list of elective areas available to the students. The course sequences for elective areas in Antennas and Microwaves, Communications, Control, Electronic Devices, and Power are shown below. A student may design his/her individual elective area course sequence and follow it subject to prior approval by the Department.

The remaining technical elective course must be chosen from a list maintained by the Department.
Antennas and Microwaves

<table>
<thead>
<tr>
<th>Course</th>
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<th>Name</th>
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<tr>
<td>EL E 411</td>
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<td>Data Communications</td>
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<tr>
<td>EL E 456</td>
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<td>Software Engineering</td>
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<tr>
<td>EL E 473</td>
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<td>Microwave Engineering</td>
<td>2</td>
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<tr>
<td>EL E 474</td>
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<td>Antenna Engineering</td>
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<td>EL E 475</td>
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<td>Guided Wave Engineering</td>
<td>3</td>
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<td>EL E 498</td>
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<td>Project</td>
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Communications

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<tbody>
<tr>
<td>EL E 411</td>
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<td>Data Communications</td>
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<td>EL E 412</td>
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<td>Digital Communications</td>
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<tr>
<td>EL E 413</td>
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<td>Digital Signal Processing</td>
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<tr>
<td>EL E 428</td>
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<td>Computer Communications Networks</td>
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<tr>
<td>EL E 456</td>
<td></td>
<td>Software Engineering</td>
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<tr>
<td>EL E 498</td>
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<td>Project</td>
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Control

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<tr>
<td>EL E 446</td>
<td></td>
<td>Linear Systems</td>
<td>3</td>
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<td>EL E 456</td>
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<td>Software Engineering</td>
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<tr>
<td>EL E 481</td>
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<td>Design of Analog and Digital Control Systems</td>
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<td>EL E 482</td>
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<td>Multivariable Control Systems</td>
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<td>EL E 485</td>
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<td>Computer Control Applications</td>
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Electronic Devices

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<tr>
<td>EL E 435</td>
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<td>Semiconductor Devices</td>
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<td>EL E 436</td>
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<td>Design of Integrated Circuits and Devices</td>
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<td>EL E 438</td>
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<td>Switching and Digital Circuits</td>
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<td>EL E 439</td>
<td></td>
<td>Analog Electronic Circuits</td>
<td>2</td>
<td>1</td>
<td>3*</td>
</tr>
<tr>
<td>EL E 456</td>
<td></td>
<td>Software Engineering</td>
<td>3</td>
<td>1</td>
<td></td>
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<tr>
<td>EL E 498</td>
<td></td>
<td>Project</td>
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Power

<table>
<thead>
<tr>
<th>Course</th>
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<th>T</th>
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<tr>
<td>EL E 456</td>
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<td>Software Engineering</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>EL E 463</td>
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<td>Power Electronics</td>
<td>2</td>
<td>1</td>
<td>3*</td>
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<tr>
<td>EL E 464</td>
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<td>High Voltage &amp; Insulation Engineering</td>
<td>3</td>
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<td>EL E 465</td>
<td></td>
<td>Power Systems</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>EL E 485</td>
<td></td>
<td>Computer Control Applications</td>
<td>2</td>
<td>1</td>
<td>3*</td>
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<td>EL E 498</td>
<td></td>
<td>Project</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Indicates laboratory every second, every third week, or open lab. See Course Descriptions.

Electrical Engineering

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 a minimum of eight technical electives (taken during the last two terms). These technical electives include the possibility of working on a design or research project. In addition, students must satisfy Faculty of Engineering general studies requirements by choosing suitable elective courses.

The normal recommended program shown below involves a course load (excluding seminars) of five or six courses per term. Laboratory exercises are compulsory where they form part of a course.

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 9:3).

Students must register their course load at the start of each term. Departmental permission at the time of registration will be required for departures from the normal load in any one term.

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 9:3).

General Studies Electives

Five courses, including the general studies course in the 1B term, must satisfy the General Studies Program requirements described on p. 9:6.

Options in Electrical Engineering

The normal Electrical Engineering program shown has been designed to offer a well balanced and rewarding education. Students wishing to enrich their education 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:

- CS 240 Programming Principles, Languages and Techniques 2B
- CS 340 Data Structures 3A
- CS 354 Software Systems 3B
- EL E 427 Digital Systems Engineering 4B

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 at the beginning of the 2A term.

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 9:23) designed for those students with an interest in the management of technology. Further details are made available at the beginning of the 2A term.

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 9:7) designed to give students a broad background in either pure or applied mathematics. Further details are made available at the beginning of the 2A term.

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 9:7) designed to give students an enriched background in the fundamentals of physical science. Further details are made available during the 1B term.

The successful completion of these courses results in a designation on the transcript "Option in Physics."

ACADEMIC PROGRAM 1987/88

Note 1
With the approval of the department in terms 4A and 4B, students may take technical courses offered by other departments.

Note 2
The laboratory hours shown are approximate indications of the average time the student will spend in the laboratory.
### Term 3B Winter

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EL E 302</td>
<td>Seminar</td>
<td>3</td>
</tr>
<tr>
<td>ME 250</td>
<td>Thermodynamics</td>
<td>3</td>
</tr>
<tr>
<td>EL E 318</td>
<td>Communications</td>
<td>3</td>
</tr>
<tr>
<td>EL E 323</td>
<td>Digital Circuits</td>
<td>3</td>
</tr>
<tr>
<td>EL E 380</td>
<td>Systems &amp; Control</td>
<td>3</td>
</tr>
<tr>
<td>General Studies Elective</td>
<td></td>
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</tr>
</tbody>
</table>

### Term 4B, Winter (Continued)

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME 2A</td>
<td>EL E 269 Electrical Engineering</td>
<td></td>
</tr>
</tbody>
</table>

### Term 4B, Winter (Continued)

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EL E 475</td>
<td>Guided Wave</td>
<td></td>
</tr>
<tr>
<td>EL E 482</td>
<td>Multivariable Control Systems</td>
<td></td>
</tr>
<tr>
<td>EL E 485</td>
<td>Computer Control</td>
<td></td>
</tr>
<tr>
<td>EL E 499B</td>
<td>Project</td>
<td></td>
</tr>
</tbody>
</table>

Any 600-level courses taken by students in fourth year can only be counted toward the BASc. The combined Bachelor's - Master's program in Electrical Engineering has the same number of courses as the BASc program plus the MASc program.

### Service Course

ME 2A EL E 269 Electrical Engineering 2

*Indicates laboratory every second, every third week, or open lab. See Course Descriptions.

†General electives may be General Studies Electives, or if the General Studies requirements have been satisfied, Electrical Engineering technical electives or any course that is approved by the Undergraduate Officer. If two General Studies electives are taken in fourth year, at least one must be a second-level course or higher. Students taking courses from group C in the program need the approval of the Undergraduate Officer.

### 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.

There are four areas of specialization within Geological Engineering:

1. geotechnical engineering and geohydrology
2. petroleum geology and engineering
3. rock mechanics and mine design
4. applied geophysics and exploration
The program offered at Waterloo concentrates on environmental aspects, but some specialization is available in rock mechanics and petroleum engineering as well. A special program in geohydrology beginning in 3A is available, but written permission from the Program Chairman is required to take it.

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 developments, 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 280 Applied Geophysics  
CIV E 203 Statics  
CIV E 204 Mechanics of Solids I  
CIV E 221 Calculus 2  
CIV E 291 Survey Camp

**Term 2B, Spring**  
CIV E 222 Differential Equations  
CIV E 223 Computer Workshop  
CIV E 280 Fluid Mechanics  
EARTH 221 Geochemistry I  
EARTH 232 Petrography  
EARTH 238 Intro. Structural Geology  
Social Sciences & Humanities Elective.

**Term 3A, Winter**  
CIV E 300 Civil Engineering Project 1  
CIV E 353 Geotechnical Engineering 1  
EARTH 333 Sedimentology  
EARTH 370 Economic Geology  
EARTH 390 Field Methods  
EARTH 438 Engineering Geology  
(CIV E 375 Water Quality Eng. is available to those in the geohydrology option)  
Social Sciences & Humanities Elective (SCI 209 Technical Writing is strongly recommended)

**Term 3B, Fall**  
EARTH 437 Rock Mechanics  
CIV E 224 Probability and Statistics  
CIV E 292 Engineering Economics  
CIV E 354 Geotechnical Engineering 2  
Social Sciences & Humanities Elective.  
Elective from:  
EARTH 331 Igneous Petrology  
EARTH 342 Geomorphology  
CIV E 381 Hydraulics (Geohydrology option only)

**Term 4A, Fall**  
EARTH 440 Quaternary Geology  
EARTH 456 Numerical Meth. in Geoscience  
EARTH 458 Physical Hydrogeology  
EARTH 490 Field Trip  
GEO E 400 Geological Engineering Project 1  
Social Sciences & Humanities Elective.  
Elective from:  
EARTH 421 Geology of the Earth's Surface  
EARTH 470 Metallogeny of the Earth  
CIV E 472 Wastewater Treatment  
CIV E 486 Hydrology

**Term 4B, Winter**  
GEO E 401 Geological Engineering Project 2  
Social Sciences & Humanities Elective.  
Electives from:  
EARTH 332 Metamorphic Petrology  
EARTH 427 Crustal Evolution  
EARTH 432 Precambrian Geology  
EARTH 433 Applied Sedimentology  
EARTH 435 Advanced Structural Geology  
EARTH 460 Applied Geophysics I  
CIV E 422 Finite Element Analysis  
CIV E 430 Experimental Mechanics  
CIV E 440 Transport Systems Analysis  
CIV E 454 Geotechnical Engineering 3  
CIV E 491 Engineering Law  
CIV E 493 Engineering in the Canadian North  
CH E 602 Fundamentals of Petroleum Production  
CH E 550 Introduction to Extractive Metallurgy  
(For the geohydrology option, students take  
CIV E 473 Contaminant Transport  
CIV E 480 Water Resources Management  
EARTH 459 Chemical Hydrogeology)
Management Sciences

Introduction
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.

Degrees Conferred
The Department confers degrees only at the graduate level (the MASc and PhD).

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 certain 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, EL E 316, SY DE 213)

M SCI 261 Managerial and Engineering Economics I (F,W,S) (equivalents CH E 044, CIV E 292, SY DE 131)

*M SCI 211 Organizational Behaviour (F,W,S)

*M SCI 331 Operations Research I (F,W,S) (equivalent SY DE 311)

Plus three of the following or equivalents

M SCI 452 Behavioural Decision Analysis, (W) (equivalent SY DE 333)

*M SCI 461 Managerial and Engineering Economics II (F,W) (equivalent ECON 201)

M SCI 431 Operations Research II (S) (equivalent SY DE 411)

*M SCI 432 Introduction to Production (F,W,S) (equivalent M E 448)

*M SCI 311 Organizational Behaviour II (F,W)

* These courses can be counted as part of the General 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 M.B.A.

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.

In order to facilitate the taking of the Option the sample schedules shown below will enable the student to:

a) fulfill the requirements of the Option
b) fit into their General Studies requirements
c) qualify for some advanced standing toward an M.B.A. at WL or an MASc in Management Sciences at UW.

Other arrangements of courses are possible. Also M SCI 211 and 311 are available by correspondence.
Chemical Eng.
2A CH E 022* (required)
2B M SCI 211 + * (required)
3A M SCI 331* (required must be taken as an extra course)
3B M SCI 311 + *
4A CH E 044 (required)
   M SCI 432*
4B M SCI 461 + *

Civil Eng.
2A CIV E 292 (required)
   CIV E 224* (required)
2B M SCI 211 + * (required)
3A M SCI 331* (required)
The three optional courses can be chosen in 3B, 4A and 4B.

Computer Eng.
2A M SCI 261 (required)
2B M SCI 211 + * (required)
3A EL E 316* (required)
   M SCI 311 + *
3B M SCI 331* (required)
4A M SCI 432*
4B M SCI 461 + *

Electrical Eng.
2A M SCI 261 (required)
2B M SCI 211 + * (required)
3A EL E 316* (required)
   M SCI 331 + *
3B M SCI 311 + *
4A M SCI 461 + *
4B M SCI 432*

Mechanical Eng.
2A M SCI 251* (required)
2B M SCI 261 (required)
3B M SCI 331* (required)
4A M SCI 211 + * (required)
The three optional courses can be chosen in 4A and 4B.

Systems Design Eng.
1B SY DE 131 (required)
2A SY DE 213* (required)
3A M SCI 331* (required)
3B M SCI 211 + * (required)
The three optional courses can be chosen in 4A and 4B.

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; and also 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 (general studies) courses are included in each of the 4 years.

Each student is responsible for selecting his own program of electives, in keeping with his 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:
a) 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.

b) Environmental (Geophysical) Fluid Dynamics Option
This Option is closely linked with Option (a), 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.

c) 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.

d) Engineering 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.

e) Production and Automation
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.

f) 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 general studies courses very early in order to ensure that the general studies requirements will be met. (See note on following page, under elective courses).

A) 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  
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 482 Mechanical Engineering Projects  
M SCI 251 Probability and Statistics (Equivalent to M E 202)  
M SCI 251 Managerial and Engineering Economics 1  
EL E 269 Electrical Engineering 2

b) Non Credit Courses
M E 200 Introduction to Mechanical Engineering 1  
M E 300 Introduction to Mechanical Engineering 2  
M E 400 Introduction to Mechanical Engineering 3

B) Elective Courses

a) General Studies Electives
Students entering the program will take five General 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 General Studies in the Faculty of Engineering.

b) Technical Electives
Ten 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 his own 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 Chairman for Undergraduate Studies.

As a guide, typical lists of electives for the five Option areas available from within the Department of Mechanical Engineering are given below:

a) 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 565 Gas Dynamics
- M E 566 Fluid Mechanics 3
- M E 568 Noise Analysis and Control
- M E 569 Fluid Mechanics-Design Topics

b) Environmental Fluid Mechanics:
- M E 469 Introduction to the Environmental Sciences
- 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

c) 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 and Stress Analysis in Design
- 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 Brittle Fracture

Development 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
- M E 533 Composite Materials
- M E 534 Non-metallic Materials
- M E 541 Deformation Processes
- M E 543 Metal Casting Processes
- M E 544 Welding
- M E 559 Finite Element Methods

Production and Automation Option
- M E 435 Industrial Metallurgy
- M E 443 Metal Casting Processes
- M E 447 Automation and Robotics
- M E 448 Production Engineering; Design of Manufacturing Systems
- M E 463 Tribology 1
- M E 541 Deformation Processes
- M E 542 Metal Cutting
- 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 566 Noise Analysis and Control

d) 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 Department of Management Sciences.

- 1A (F) - none
- 1B (W,S) none
- 2A (F,W) M SCI 251
- 2B (S,F) M SCI 261
- 3A (W,S) none
- 3B (F,W) M SCI 211* plus three
- 4A (S,F) of M SCI 311*, M SCI 431, M SCI 432
- 4B (W) M SCI 452*, M SCI 461*

Note:
Only three of M SCI 311, 431, 452, and 461 are required for the option. M SCI 432 can be taken in lieu of M SCI 431 for the purpose of satisfying the option requirements.
The Mechanical Engineering curriculum structure is summarized in the following table:

### Table A - The Mechanical Engineering Undergraduate Program

<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>
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<tr>
<td>2A (F,W)</td>
<td>ME 200</td>
</tr>
<tr>
<td>2B (S,F)</td>
<td>M E 203</td>
</tr>
<tr>
<td>3A (W,S)</td>
<td>ME 300</td>
</tr>
<tr>
<td>3B (F,W)</td>
<td>M E 322</td>
</tr>
<tr>
<td>4A (S,F)</td>
<td>M E 400</td>
</tr>
<tr>
<td>4B (W)</td>
<td>5 TECH ELECT†</td>
</tr>
</tbody>
</table>

* A technical elective may be substituted for the general studies elective in 3B with the combination of an extra general studies and one less technical elective in either 4A or 4B.

† A project course, ME 482, may be taken in the 4A and 4B terms as a technical elective for each of these terms.
Systems Design Engineering

Introduction
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 economics, 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), the Systems Design Engineer may apply for registration as a Professional Engineer. If a Masters degree (MASc) 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 Accreditation Board (CAB) is a national organization that has representation from all of the Provincial Professional Engineering Associations. The CAB 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 CAB 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 degrees, and in the past many Systems Design Engineering students have gone on to successfully 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-Masters 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 of 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 Chairman for Undergraduate Studies
Department of Systems Design Engineering
University of Waterloo
Waterloo, Ontario, N2L 3G1
(519) 885-1211 Ext. 3113

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
1BASc Bachelor of Applied Science
2MASc Master of Applied Science
3PhD 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 option 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 and Systems Behaviour followed by a series of challenging problem 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 his 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
Listing by Terms

1A (Fall Term)
SY DE 101 Tutorial
SY DE 111 Calculus 1
SY DE 113 Linear Algebra
SY DE 121 Digital Computation
SY DE 131 Engineering Economics
SY DE 161 Introduction to Systems Design Engineering
SY DE 181 Statics

1B (Spring Term)
SY DE 102 Tutorial
SY DE 112 Calculus 2
SY DE 122 Introduction to Computer Systems
SY DE 142 Introduction to Ergonomics
SY DE 182 Dynamics
SY DE 184 Introduction to Chemical Systems
1 General Studies Program Elective
Additionally there are Option programs called Management Sciences and Computer Engineering, offered in conjunction with the Management Sciences and Electrical Engineering Departments, respectively. Students who elect either of these Options will receive a final academic transcript from the University with a statement that the Option has been successfully completed.

It is also possible for a student to organize an Option to suit his or her own special requirements. This is done by choosing a set of technical elective courses which, if approved by the Associate Chairman of Systems Design Engineering, will constitute an individual technical Option for that student.

Each technical Option in Systems Design Engineering consists of a specified set of technical elective courses taken in the 3A, 3B, 4A and 4B terms. The third and fourth year curriculum is structured as shown:

```
3A
6 mandatory courses
1 technical elective course

3B
4 mandatory courses
2 technical elective courses
1 General Studies Program elective

4A
2 mandatory courses
3 technical elective courses
2 General Studies Program electives

4B
2 mandatory courses
3 technical elective courses
1 General Studies Program elective
```

**SUMMARY OF THE SYSTEMS DESIGN ENGINEERING TECHNICAL OPTIONS**

**Design and Human Systems Option**
The Design and Human Systems Option embraces in whole or in part a wide spectrum of "professional" areas known as human factors engineering, human engineering, ergonomics, occupational health and safety, biomedical engineering, and elements of various technical and non-technical disciplines such as aesthetics, perceptual psychology, marketing, mechanics, materials, etc.

However, the concentration within the Systems Design Engineering program is on the human problem to be solved rather than on one of these professional or discipline areas. Thus, courses will be selected, under supervision, to provide the knowledge and expertise required to define and solve problems arising at the interface between man and machine (artifact), or man and environment.
Problem areas chosen might include:
- design for extreme human environments
- design where anthropometric aspects are dominant
- design of instrumentation for human operators
- design problems associated with occupational health and safety in industry, transportation, etc.
- medical design problems involving engineering technology
- design of consumer products used in recreation and normal living
- design involving human engineering
- human aspects of engineering ecology
- design of human "micro-environments"
- problems of ergonomics and industrial hygiene

Socio-Economic Systems Option
When planning, designing and operating a large-scale engineering project, the various interactions between the project and its social environment must be considered. For example, the James Bay hydroelectric project in Northern Quebec has had important economic, social and political consequences upon the population affected by the undertaking. The purpose of the socio-economic option is to equip the students with a specific set of tools and also a general philosophical approach for tackling socio-economic problems that Systems Design Engineers are often confronted with.

To familiarize the students as quickly as possible with socio-economics, an engineering economics course is given during the first term of classes. Fundamental mathematics courses such as probability and statistics are taken during the first two years and they form the foundation stones for socio-economic courses which are available in later terms. Techniques are taught for analyzing socio-economic situations by use of operations research, optimization, game theory, time series analysis and the social sciences. By selecting additional elective courses, students may pursue further topics in the social sciences and operations research. Furthermore, illustrative application problems are presented within each course so that the students may fully appreciate how these methods work in practice. Additional experience in studying the socio-economic aspects of engineering design may be obtained by doing workshop projects in this area.

Physical and Computer Systems Option
In this Option the student is provided an opportunity to study in some depth a unified approach of Physical Systems Theory to mathematical modelling, analysis, simulation and design of a variety of engineering systems such as electrical, mechanical, hydraulic, structural systems and their combinations. Essential concepts and tools from linear systems theory, transform methods, frequency and time domain modelling and analysis, control systems, graph theory and computer simulation techniques are given in the earlier years followed by technical electives dealing with such topics as large-scale systems, algorithms for computer-aided-analysis and design in the final years. Students may also take technical courses in specific areas in other departments.

The Department recognizes the tremendous growth and impact of electronic computing systems on technology and society. For those students concerned with the application of computers this Option provides several courses and opportunities to learn about computer hardware (structure of digital and analog computers, microcomputers and micro-processors), computer software (algorithmic, simulation and problem-oriented software), and principles of computer-aided design.

Option in Management Sciences
The Management Science 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 Science in addition to the Engineering degree. The Management Sciences program for a Systems Design Engineering student consists of the following optional courses:

<table>
<thead>
<tr>
<th>Academic</th>
<th>Management Sciences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Term</td>
<td>Management Sciences</td>
</tr>
<tr>
<td>1A</td>
<td>SY DE 333 Applied Statistics</td>
</tr>
<tr>
<td>1B</td>
<td>M SCI 461 Managerial &amp; Engineering Economics 2</td>
</tr>
<tr>
<td>2A</td>
<td>SY DE 411 Probabilistic Modelling</td>
</tr>
<tr>
<td>2B</td>
<td>M SCI 211 Organizational Behaviour 1</td>
</tr>
<tr>
<td>3A</td>
<td>2 other Technical Electives.</td>
</tr>
<tr>
<td>3B</td>
<td>M SCI 311 Organizational Behaviour 2</td>
</tr>
<tr>
<td>4A</td>
<td>3 other Technical Electives.</td>
</tr>
</tbody>
</table>

In order to successfully complete this option, students must obtain at least 50% in each of the option courses and an overall average in them of at least 60%.
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 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. The following is a recommended set of eight courses for students specializing in this option area:

<table>
<thead>
<tr>
<th>Academic Term</th>
<th>Option in Computer Engineering</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A F</td>
<td></td>
</tr>
<tr>
<td>1B S</td>
<td></td>
</tr>
<tr>
<td>2A W</td>
<td></td>
</tr>
<tr>
<td>2B F</td>
<td></td>
</tr>
<tr>
<td>3A S</td>
<td>CS 240 Programming Principles and Languages</td>
</tr>
<tr>
<td>3B W</td>
<td>SY DE 352 Algorithms for Computer-Aided Systems Analysis</td>
</tr>
<tr>
<td></td>
<td>CS 340 Data Structures</td>
</tr>
<tr>
<td>4A F</td>
<td>SY DE 421 Computer Aided Design</td>
</tr>
<tr>
<td></td>
<td>EL E 323 Digital Circuits &amp; Systems</td>
</tr>
<tr>
<td></td>
<td>1 other Technical Elective</td>
</tr>
<tr>
<td>4B W</td>
<td>EL E 427 Digital Systems</td>
</tr>
<tr>
<td></td>
<td>1 other Technical Elective</td>
</tr>
</tbody>
</table>

Note: students must successfully complete at least one of SY DE 421 or SY DE 422 in the 4A or 4B terms.

The two technical elective courses in 4A/B should be in the option area. In selecting specific elective courses in 3A and 3B, students should pay attention to the prerequisite requirements of 4th year elective courses, especially in Computer Science and Electrical Engineering Departments.

In addition to the above elective courses, the students are required to take several courses as part of their core program. These courses substantially enhance and augment the capabilities of students in this area. These include:

SY DE 121 Digital Computation
SY DE 122 Introduction to Computer Systems
SY DE 321 Numerical Analysis and Computer Methods
SY DE 322 Computer Simulation of Systems
SY DE 292 Digital Circuits and Systems Laboratory
SY DE 391 Analog Circuits and Systems Laboratory
SY DE 392 Control Systems Laboratory

and workshop courses.

Special Individual Option

Some Systems Design Engineering students may wish to design their own Option program which consists of technical courses drawn from the wide variety of subjects taught at the University. Special Individual Options must be organized in conjunction with a faculty advisor in the Department of Systems Design Engineering by the 3A term and must be approved by the Associate Chairman for Undergraduate Studies of the Department.

As an example, a student who wishes to study water resources or transportation engineering could take some of the socio-economic courses from Systems Design in conjunction with the appropriate subjects from the Civil Engineering Department.

Note

Transitional graduate courses (numbered in the 500's) are available for credit to senior undergraduate students registered in departments other than Systems Design Engineering.
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. 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
- **MA**
  Regional Planning and Resource Development
- **PhD**
  Geography
- **PhD**
  Regional Planning and Resource Development

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.

To be selected for the Dean's Honours List, full- and part-time students must attain a minimum cumulative overall average of at least 80% at the completion of each academic year.

The Faculty has several awards granted to students for meritorious performance, e.g. Dean's Honours List, Alumni Gold Medal, monetary prizes. Further information on this can be obtained from the office of the Associate Dean, Undergraduate Studies.
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.

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 Grade 13 or Ontario Academic Course credit in Mathematics or equivalent for admission to programs in Environmental Studies; Grade 13 or Ontario Academic Course credit in Geography or equivalent is similarly recommended for those applying to the Geography Department. For applicants to the School of Architecture, Functions and Relations, Calculus, Physics and English (Francais) or equivalent at the Ontario Grade 13 or Ontario Academic Course level are required.

Interviews

Students being seriously considered for admission to the School of Architecture are normally required to participate in an interview as part of the admission process. In addition, a test in the form of a precis 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.

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.

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 Requirement

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). Students may demonstrate their competence in writing by achieving a passing grade on this Examination as determined by the students' Department/School. If students do not achieve a passing grade on this examination, they must successfully complete the assignments of the University of Waterloo Writing Clinic and/or by completing course work. The English Language Proficiency Requirement is recorded on students' academic record as Arts 000 Y.

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 16 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 10 term courses will be considered Year One students; those who have passed at least 10 but fewer than 20 will be considered Year Two students; those with at least 20 but fewer than 32, Year Three; and those with 32 or more, Year Four.

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 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.
b) 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.

c) A student will be eligible for make-up examinations only when failure to pass is attributable to extraordinary circumstances. In addition, students:
1. 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;
2. must have secured the permission of the professor concerned.

2. Appeals
Appeals against Departments/Schools decisions are handled at three progressive levels:
1. Disputes between students and instructors should be fully discussed at that level;
2. Problems not resolved to either party's satisfaction should be referred to the Department/School Undergraduate Affairs Committee;
3. Lack of mutual satisfaction at that level would involve the dispute being forwarded to the Associate Dean, Undergraduate Studies, for discussion with the Faculty Undergraduate Studies Committee.

3. 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.

4. Standing
a) 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.

b) 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.

c) Students receiving an incomplete (INC), did not write (DNW), 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 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.

d) To be considered in good standing in the Honours programs, a student must maintain a cumulative overall average of at least 65.0% and an average in the chosen field of specialization as specified in the regulations of the relevant Department/School. 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 (e) below will apply.

e) To be considered in good standing in the General Geography programs, a student must maintain a cumulative overall average of at least 60.0% 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 2 consecutive academic terms during which period he/she must obtain good standing or he/she will be asked to withdraw.

f) The only general programs in the Faculty are the General Geography programs. The BES program in the School of Architecture is a pre-professional program. A regular (full-time) student in the General Geography programs must in each
academic year enrol in 10 term courses. A regular student in the Honours programs must each year enrol in at least 10 term courses (unless otherwise specified in a departmental Honours program). Full-time students may be enrolled for additional or fewer courses only after obtaining the approval of the appropriate Undergraduate Officer.

g) 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.

h) 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.

i) 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 38 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.

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, Chairperson 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.

Note: Environmental Studies students wishing to take courses where full enrolment might be expected, such as ENV S 200, should study their scheduling carefully to ensure that the courses can be fitted, at some time, into their undergraduate program.

Course and Program Changes

a) Students may add and drop courses before and during the first two weeks of classes in the term in which the courses begin.

b) 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.

c) 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 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.

d) All schedule changes at any time must be submitted to the designated department/school office.

e) Students are encouraged not to register for more courses than their programs require unless exceptional circumstances can be demonstrated.

f) Full-time students may reduce their programs below the specified minimum only upon the recommendation of the undergraduate officer of the major department/school.

g) 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. Students who voluntarily withdraw may be eligible for tuition fee and residence refunds depending on the effective date of withdrawal. (See the Calendar of Important Dates).

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
A student exchange agreement between Waterloo and the School of Australian Environmental Studies at Griffith University, Brisbane, Queensland came into effect in 1985-86. Another is about to begin with the environmental studies program at Victoria College, Clayton (near Melbourne), Victoria. Under this arrangement, a small number of students from the University of Waterloo could take one or two semesters of courses at Griffith or Victoria during their third year which would be credited towards their degree at Waterloo, and vice versa. For additional information, contact the Associate Dean, Undergraduate Studies.

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. They 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, statistics and computer science as tools for analyzing 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 objective 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/course fee for each term.

See Recommended Core Program for course arrangement, page 10:8.
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 Fall</td>
<td>ARCH 112 Mathematics</td>
<td>ARCH 195 Introduction to Architecture</td>
<td>ARCH 142 Iconography I</td>
<td>ARCH 192 Design Fundamentals</td>
</tr>
<tr>
<td>Sept-Dec</td>
<td>ARCH 171 Theories and Technologies of Building</td>
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<td></td>
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<tr>
<td>TOTAL 4 cr</td>
<td></td>
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</tr>
<tr>
<td>1B Winter</td>
<td>CS 100 Introduction to Computer Usage</td>
<td>ARCH 143 Iconography II</td>
<td>ARCH 193 Design Fundamentals and Studio</td>
<td></td>
</tr>
<tr>
<td>Jan-Apr</td>
<td>ARCH 163 Statics and Structural Analysis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL 4 cr</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Off-Term</td>
<td>A student is free to use the off-term as he wishes. The Department of Co-ordination does not provide their normal services to arrange employment for students in this term. (See Chapter 5)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Spring</td>
<td></td>
<td></td>
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<tr>
<td>May-Aug</td>
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</tr>
<tr>
<td>2A Fall</td>
<td>ARCH 262 Strength of Materials</td>
<td>ARCH 246 Foundations of Europe</td>
<td>ARCH 292 Design Concepts</td>
<td></td>
</tr>
<tr>
<td>Sept-Dec</td>
<td>ARCH 266 Building Construction II</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>TOTAL 4 cr</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<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-ordination, who maintain liaison with prospective employers. The experience a student may get during the work term may include: introduction to office procedures; assisting in design presentation and model building; minor drafting assignments.</td>
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<tr>
<td>Winter</td>
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<tr>
<td>Jan-Apr</td>
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<tr>
<td>May-Aug</td>
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<tr>
<td>TOTAL 4 cr</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Co-op Work Term 2</td>
<td>The type of experience a student may obtain in this term includes assisting in design presentation and model buildings; assisting in preparation and corrections to site plans, floor plans, and elevations, and on-site measurements.</td>
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<tr>
<td>Fall</td>
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<td></td>
</tr>
<tr>
<td>Sept-Dec</td>
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<tr>
<td>Jan-Apr</td>
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<tr>
<td>TOTAL 3.5 cr</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Co-op Work Term 3</td>
<td>The type of experience a student may obtain in this term includes design research; detailed design developments; design presentation; assisting in preparation of site plans, floor plans, elevations, building cross-sections.</td>
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<tr>
<td>Spring</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>May-Aug</td>
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<td></td>
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</tr>
<tr>
<td>3B Fall</td>
<td>ARCH 363 Concrete: Design, Structure and Construction</td>
<td>ARCH 373</td>
<td>ARCH 393 Design Concepts and Studio</td>
<td></td>
</tr>
<tr>
<td>Sept-Dec</td>
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<tr>
<td>TOTAL 3.5 cr</td>
<td></td>
<td></td>
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<tr>
<td>TOTAL 23 credits</td>
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</table>
Program for the Degree of Bachelor of Architecture

<table>
<thead>
<tr>
<th>Year/Term</th>
<th>Systems and Measures</th>
<th>Culture</th>
<th>Design</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theme Area</td>
<td>Theme Area</td>
<td>Theme Area</td>
</tr>
<tr>
<td>Co-op Work Terms</td>
<td>This period of eight months may serve many objectives. A student after the first degree program has time in which he may travel and decide about his future goals before returning to the School for the second degree program. During that time a student may continue the co-op terms wherein he obtains experience in design research; assisting in the development of conceptual designs and schematics, preparation of site plans and details, floor plans, elevations, cross-sections and standard details; assisting the site architect or construction superintendent.</td>
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<tr>
<td>4 &amp; 5 Winter and</td>
<td></td>
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<tr>
<td>Spring-Jan-Aug</td>
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<td></td>
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<tr>
<td>4-A Fall</td>
<td>FE</td>
<td>ARCH 446</td>
<td>ARCH 492</td>
</tr>
<tr>
<td>Sept-Dec</td>
<td></td>
<td>ARCH 448</td>
<td>Design Studio</td>
</tr>
<tr>
<td>TOTAL 3½ cr.</td>
<td></td>
<td>Rome and the Campagna</td>
<td>(2 credits)</td>
</tr>
<tr>
<td>4-B Winter</td>
<td>ARCH 452</td>
<td>FE</td>
<td>ARCH 493</td>
</tr>
<tr>
<td>Jan-Apr</td>
<td>Specifications</td>
<td></td>
<td>Design Studio</td>
</tr>
<tr>
<td>or</td>
<td>FE</td>
<td></td>
<td>(2 credits)</td>
</tr>
<tr>
<td>Spring-May-Aug</td>
<td>ARCH 499</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL 3½ cr.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Co-op Work Terms</td>
<td>This is the last Co-op term of eight months before the final year of study. On the basis of previous experience in a variety of jobs, a student is capable of handling somewhat advanced work in professional offices such as: design research; preparation of design schematics and small project design; preparation of site plans and details; development of special details; co-ordination of consultants’ work, assisting site architect on small projects and assisting construction superintendent on large projects.</td>
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<tr>
<td>6 &amp; 7 Winter or</td>
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<tr>
<td>Spring, and Fall</td>
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<td></td>
<td></td>
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<tr>
<td>Fall-May-Dec</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>5-A Winter</td>
<td>FE</td>
<td></td>
<td>ARCH 592</td>
</tr>
<tr>
<td>Jan-Apr</td>
<td></td>
<td></td>
<td>Design Studio</td>
</tr>
<tr>
<td>TOTAL 3½ cr.</td>
<td></td>
<td></td>
<td>(3 credits)</td>
</tr>
<tr>
<td>5-B Spring</td>
<td>ARCH 555</td>
<td>Architectural Practice</td>
<td>ARCH 593</td>
</tr>
<tr>
<td>May-Aug</td>
<td></td>
<td></td>
<td>Design Studio</td>
</tr>
<tr>
<td>TOTAL 3½ cr.</td>
<td></td>
<td></td>
<td>(3 credits)</td>
</tr>
<tr>
<td>TOTAL 14 credits.</td>
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</tbody>
</table>

Electives
Students are permitted to study courses given by the University at large which are in the area of the student’s individual interest, with the aim of providing better orientation and more interdisciplinary communications.

(FE) Free Elective Courses selected by the student without restrictions as long as the course is approved by Senate.

Note
Department approval is mandatory for a FE.
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:

a) Maintain a minimum cumulative overall average of C– (60.0) calculated at the end of each term of study.

b) Pass the studio course.

c) 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.

Notes

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 (ARCH 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 half 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 two or more one-term core courses or equivalent in any single term (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 a, b, c, above.

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 a, b, c, above.

6. Course Loads

Normally students of the School are permitted to take only one more or one fewer half-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.

7. Appeals

See Faculty procedure, p. 10:4.
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 buildings, 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. Energy and Resource Conservation
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 man-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 those 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
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). 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, ability in English is 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 stress 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

Bachelor of Environmental Studies
(Honours Environment and Resource Studies)
The formal admission requirements of the program are listed beginning on page 22 of this Calendar. No specific Grade 13 courses are required, but some science or mathematics would be helpful.

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.
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 three themes.
   a) Energy and Resource Conservation
   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 under "Interdisciplinary Options".

6. Field Study Program (FSP)
   In 1980, 1983 and 1987, under the direction of a faculty member, ERS students had the opportunity to spend a term in India studying various environment/development issues. 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

<table>
<thead>
<tr>
<th>Year One</th>
<th>ENV S 195</th>
<th>Introduction to Environmental Studies</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ERS 100(F)</td>
<td>Issue Analysis and Problem-Solving 1</td>
</tr>
<tr>
<td></td>
<td>ERS 101(W)</td>
<td>Issue Analysis and Problem-Solving 2</td>
</tr>
<tr>
<td></td>
<td>ERS 150(F)</td>
<td>Environmental Methods &amp; Techniques</td>
</tr>
<tr>
<td></td>
<td>ENV S 178</td>
<td>Introduction to Environmental Research Methods</td>
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<td></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>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year Two</th>
<th>ENV S 200</th>
<th>Field Ecology</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ERS 290/</td>
<td>Seminar-Workshop</td>
</tr>
<tr>
<td></td>
<td>291</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ERS 295</td>
<td>Development of Environmental Thought 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>plus electives for a total of five term courses for the Fall term and five term courses for the Winter term. Note that 200, and/or 295 may be taken in years other than Year Two.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year Three</th>
<th>ERS 390A/</th>
<th>Seminar-Workshop (with consent of Faculty, 390B, 391B, may be taken in place of 390A, 391A.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>391A</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ERS 396</td>
<td>Development of Environmental Thought 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>plus electives for a total of five term courses for the Fall term and five term courses for the Winter term.</td>
</tr>
</tbody>
</table>
Note: Students who would like additional flexibility in fourth year, such as being off campus for the year, MUST take ERS 400 in third year.

Year Four
ERS 400 Senior Honours Seminar
ERS 490A/490B Senior Honours Assignment (with consent of Faculty, 491A/491B or 492A/492B may be taken in place of 490A/490B).
plus electives for a total of ten term courses for the Fall/Winter Session.

The Honours Co-operative Program
Terms 1A, 1B, and 4A, 4B are the same as Years One and Four respectively of the Regular program. During Fall term of Year One, those interested may apply to enter the Co-operative program effective with the beginning of Term 1B. The remainder of the Co-operative program is as follows:

Term 2A
ENV S 200 Field Ecology
ERS 290 Seminar-Workshop
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 295 Development of Environmental Thought 1
plus electives for a total of five term courses

Term 3B
ERS 391A Seminar-Workshop
ERS 396 Development of Environmental Thought 2
plus electives for a total of five term courses.

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

a) Energy and Resource Conservation
Theme Coordinators: J.B. Robinson, J. Kay, J.E. Robinson
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. The program is as follows:

Year One
Required: Regular Program

Year Two
Required: Regular Program
Theme Core
ERS 218 Canadian Energy and Resource Issues

Year Three
Required: Regular Program
Theme Core
ERS 318 Soft Resource Paths in Canada
Two of:
ERS 385 Technology/Lifestyles for a Conserver Society
ARCH 371 Designing & Building with Solar Energy
ECON 355 Economics of Energy & Natural Resources
GEOG 359 Geography of Energy
P SCI 435 Politics of Canadian Resource Development

Year Four
Required: Regular Program
Theme Core
ERS 418 Group Project

Note:
Electives are suggested from a range of economic, political science, planning and geography courses. See Theme Coordinators for up-to-date listing.

b) Environmental, Social and Technological Impact Assessment:
Theme Coordinators: R. Gibson, S. Lerner, G. Michalenko
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 (TIA/EIA/SIA). The program is as follows:

Year One
Required: Regular Program

Year Two
Required: Regular Program
Theme Core
ERS 241 Introduction to Environmental & Social Impact Assessment
**Environmental Studies**  
Environment and Resource Studies  
Geography

**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.

**Minor Programs**
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 Environment and Resource Studies. A Minor can be in any area such as Anthropology, Canadian Studies, Chemistry, Management Studies, Personnel and Administrative Studies, Psychology, etc.

**Options**
Students can elect to take one of the recognized Options within the Faculty of Environmental Studies or outside the Faculty in Society, Technology and Values (STV), Legal Studies, Canadian Studies, Gerontology, Iberoamerican Studies, Management Studies, Peace and Conflict Studies, Studies in Personality and Religion or Women's Studies. Consult the Calendar under these headings for more information.

**Department of Geography**

**Nature of the Program**
Geography is concerned with both the natural and man-made environment, studying how man has shaped it 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 10:15.

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 known as the Senior Honours Thesis.
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 10:19). i.e. 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 are admitted only after first year on the basis of academic standing and interviews. 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 10:18. 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. Co-op students may transfer to the regular Honours Geography program at any time, if they are in good standing.

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 8:24). In all programs there is emphasis on both the development of 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 Man-Environment 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 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, air photo interpretation and remote sensing, urban and economic geography, agricultural geography and rural development, regional planning and development, resources management, Canada and Europe.

Environmental Studies
Geography

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 202 Location of Economic Activities

One of:
GEOG 208 Applied Climatology
GEOG 309 Physical Climatology

One of:
GEOG 203 Regional Geography
GEOG 204 Soviet Union
GEOG 205 Africa
GEOG 220A World Regions
GEOG 221 The United States

and additional courses so that a student should have completed by the end of the second year 20 term courses including one English course from ENGL 109, 129R, 140R, 150, 209, 210.

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 Chairman (Undergraduate Studies). Normally, approval for a 6th 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. Other Comments
See notes 4, 5, 6, and 7 on Four Year programs.

B) FOUR YEAR PROGRAMS (HONOURS REGULAR AND CO-OP, GENERAL)

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 one of ENGL 109, 129R, 140R, 150 taken in Year One or ENGL 208, 210 taken in Year Two.

Year Two
ENV S 200 Field Ecology
GEOG 201 Geomorphology and Soils
GEOG 202 Economic and Urban
Geography
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 203 Regional Geography
GEOG 204 Soviet Union
GEOG 205 Africa
GEOG 220A World Regions
GEOG 221 The United States
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 391 Field Research

One of:
GEOG 307 Social Survey Techniques
GEOG 316 Multivariate Statistics
GEOG 317 Nonparametric Statistics
GEOG 318 Spatial Analysis

Environmental Studies
Geography

GEOG 319 Economic and Social Techniques for Regional Planning
GEOG 360 Preparation of Maps and Illustrations
GEOG 375 Air Photo Interpretation
GEOG 376 Environmental Remote Sensing
ENV S 378 Applications of Computer Programming in Environmental Studies

Honours students take:
GEOG 390 Senior Honours Thesis Proposal

Electives: see notes below.

Year Four
Honours students take:
GEOG 490A
GEOG 490B Senior Honours Thesis

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. 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 Chairman (Undergraduate Studies). Normally, approval for a 6th 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, major cumulative average of 65.0. Students in the Honours programs must maintain an overall cumulative average of 65.0 and a major cumulative average of 70.0. All required courses must be passed.

4. Foreign Language Requirement
Students considering graduate work should take at least two term courses in a foreign language.

5. 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.
6. Equipment and Travel 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.

7. 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 Chairman (Undergraduate Studies) and the faculty members involved.

8. Honours Co-operative Program
Students are admitted to the Co-op program only after the first 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. Admission to the Honours Co-op program follows after Honours standing is attained in Year One and after interviews by the Geography Department in the week after lectures end in the Winter term. Normally, all students achieving Honours standing are admitted.

Co-op Course Scheduling Recommendations

<table>
<thead>
<tr>
<th>Year One</th>
<th>GEOG 101, 102, 160, 275, ENV S 178</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year Two</td>
<td></td>
</tr>
<tr>
<td>Fall Term 2A</td>
<td>ENV S 200 and 278</td>
</tr>
<tr>
<td></td>
<td>One of: GEOG 208, 309</td>
</tr>
<tr>
<td></td>
<td>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</td>
</tr>
<tr>
<td></td>
<td>Winter Work Term 1</td>
</tr>
<tr>
<td></td>
<td>Spring Term 2B</td>
</tr>
<tr>
<td></td>
<td>GEOG 201, 202, and one of: 203, 204, 205, 220A, 221</td>
</tr>
<tr>
<td></td>
<td>One of: GEOG 307, 316, 317, 318, 319, 360, 375, 376. Electives</td>
</tr>
<tr>
<td>Fall Work Term 2</td>
<td></td>
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<tr>
<td>Year Three</td>
<td></td>
</tr>
<tr>
<td>Winter Term 3A</td>
<td>GEOG 381</td>
</tr>
<tr>
<td>Electives</td>
<td></td>
</tr>
<tr>
<td>Fall Term 3B</td>
<td>GEOG 390, 391</td>
</tr>
<tr>
<td>Electives</td>
<td></td>
</tr>
</tbody>
</table>

Environmental Studies
Geography

Year Four
Winter Work Term 4
GEOG 490A
Electives

Spring Term 4A
Fall Work Term 5
Winter Term 4B
GEOG 490B

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, French, German, History, Man-Environment Studies, 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 GEOG 490A, B are accepted. Required courses are GEOG 101, 102, 160, 201, 202, 275, a 200 level Regional course (see page 10:17), a 300 level Technique course (see page 10:17), 381 and ENV S 200. If scheduling difficulties arise in meeting required courses, contact the Associate Chairman (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 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 below).

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 303 Geographical Hydrology
- GEOG 304 Field and Laboratory Techniques in Geomorphology
- GEOG 308A Physical Climatology
- GEOG 400 Climatic and Periglacial Morphology
- GEOG 401 Glacial Geomorphology and Contemporary Applications
- GEOG 406 Tropical Geomorphology
- GEOG 408 Atmospheric Resource Management
- GEOG 409 Energy Balance Climatology
- GEOG 451 Soils Geography
- GEOG 461 Land Dereliction and Rehabilitation 1
- GEOG 462 Land Dereliction and Rehabilitation 2
- ARCH 224 An Introduction to Landscape Design
- BIOL 250 Ecology
- BIOL 460 Marine Biology
- CIV E 353 Geotechnical Engineering 1
- CIV E 493 Engineering in the Canadian North
- EARTH 260 Applied Geophysics 1
- EARTH 342 Geomorphology
- EARTH 370 Economic Geology
- EARTH 438 Engineering Geology
- EARTH 439 Hydrogeology
- EARTH 440 Quaternary Geology
- SCI 220 Chemistry of Pollution
- SCI 250 Environmental Geology
- SCI 453 The Seas and Man's Effect Upon Them
- SCI 454 The Inland Waters and Man's Effect Upon Them

**Canadian Geography**
- GEOG 251 Cities in Canada
- GEOG 300 Geomorphology, Southern Ontario Environment
- GEOG 309 Physical Climatology
- GEOG 311 Regional Industrial Development
- GEOG 315 Agricultural Geography
- GEOG 322 Geographical Study of Canada
- GEOG 341 Historical Geography of Canada 1
- GEOG 342 Historical Geography of Canada 2
- 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 333 Recreation Geography
- GEOG 352 The Rural-Urban Fringe
- GEOG 356 Resources Management
- GEOG 357 Conservation and Resource Management
- GEOG 358 Water Planning and Management
- GEOG 359 Geography of Energy
- GEOG 408 Atmospheric Resource Management
- GEOG 414 Energy Resources Management
- GEOG 452 Problems of Rural Land Use
- 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 490 Water Resources Management
- CIV E 486 Hydrology
- EARTH 370 Economic Geology
- ECON 241 Cost Benefit Analysis and Project Evaluation
- ECON 355 Economics of Energy and Natural Resources
- ECON 451 Advanced Topics in Resource Economics
- ENV S 201 Introduction to Environmental and Planning Law
- ENV S 401 Environmental Law
- ENV S 402 Planning Law
- ENV S 417 History of Landscape Change - 1
- ENV S 418 History of Landscape Change - 2
- ENV S 433 People in Natural Areas
- ENV S 444 Land Evaluation and Resources Management
- ENV S 500 Professional Development in Environmental Management
- GEN E 351 Information Technology and Society
ERS 218 Introduction to Canadian Energy Issues
ERS 220 Introduction to Environmental Economics
ERS 241 Introduction to Environmental and Social Impact Assessment
ERS 318 Soft Energy Paths in Canada
ERS 320 Environmental Economics (ECON 357)
ERS 351 Organizations and Environmental Management
ERS 418 Energy Research Seminar
PLAN 255 Planning Surveys and Analysis
PLAN 344 Recreation Planning
REC 210 Organization and Administration of Recreation Services
REC 230 Introduction to Outdoor Recreation
REC 301 Sociology of Leisure
REC 302 Travel and Tourism
REC 331 Outdoor Education
REC 334 Park Management
REC 432 Interpretation
REC 434 Advanced Park Planning and Management
REC 435 Recreation Resource Policy
SCI 250 Environmental Geology
SCI 453 The Seas and Man's Effects Upon Them
SCI 454 The Inland Waters and Man's Effects Upon Them
SOC 286 Sociology of Ecology
SOC 347 Sociology of Leisure

Regional Development
GEOG 311 Regional Industrial Development
GEOG 315 Agricultural Geography
GEOG 350 Regional Urban Systems
GEOG 319 Economic and Social Techniques for Regional Planning
ECON 241 Cost-Benefit Analysis and Project Evaluation
ECON 333 Interregional Economics
ECON 335 Economic Development
ECON 365 Economic Development of Modern Europe
M SCI 261 Managerial and Engineering Economics 1
M SCI 461 Managerial and Engineering Economics 2
PLAN 232 Rural Planning and Development
PLAN 259 Regional Planning and Development
PLAN 333 The Sociology of Regional Planning
PLAN 360 Technology in Urban and Regional Planning
PLAN 370 Land Development Planning
P SCI 343 Canadian Municipal Government
P SCI 344 The Politics of Local Government
REC 302 Travel and Tourism
SOC 256 Ethnic and Racial Relations

Environmental Studies
Geography

Regional Geography
GEOG 225R Urbanization in the Third World
GEOG 226R Food, Agriculture, and Integrated Rural Development in the Third World
GEOG 204 Soviet Union
GEOG 205 Africa
GEOG 220A/B World Regions
GEOG 221 The United States
GEOG 322 Geographical Study of Canada
GEOG 323 Comparative Regional Problems
GEOG 325R Topics in Development of the Third World
GEOG 332 Topics in Population Geography: Health and Disease
GEOG 341 Historical Geography of Canada 1
GEOG 342 Historical Geography of Canada 2
GEOG 421A/B Europe and the Mediterranean
GEOG 422 Canada
GEOG 423 Central and Eastern Europe
GEOG 424 Soviet Union
GEOG 425 Africa
GEOG 430A/B/C Field Research in Regional Geography
SOC 252 Migration and Society

Methods and Techniques
GEOG 307 Social Survey Techniques
GEOG 316 Multivariate Statistics
GEOG 317 Nonparametric Statistics
GEOG 318 Spatial Analysis
GEOG 319 Economical and Social Techniques for Regional Planning
GEOG 360 Preparation of Maps and Illustrations
GEOG 375 Air Photo Interpretation
GEOG 376 Environmental Remote Sensing
GEOG 403 Computer Cartography
GEOG 404 Cartographic Production and Design
GEOG 407 Field and Lab Techniques in Geomorphology
GEOG 470 Applied Air Photo Interpretation
GEOG 471 Advanced Remote Sensing
ECON 321 Introduction to Econometrics
ENV S 252 Media Tools for Environmental Studies
ENV S 253 Media Tools for Environmental Studies — Advanced Level
ENV S 378 Applications of Computer Programming in Environmental Studies
ERS 241 Introduction to Environmental and Social Impact Assessment
PLAN 255 Planning Surveys and Analysis
Urban-Economic Geography
GEOG 251 Cities in Canada
GEOG 311 Regional Industrial Development
GEOG 315 Agricultural Geography
GEOG 349 The City as a System
GEOG 350 Regional Urban Systems
GEOG 352 The Rural-Urban Fringe
GEOG 359 Geography of Energy
GEOG 411 Geography of Manufacturing Firms and Industries
GEOG 448 Urban Historical Geography
GEOG 450 City and Regional Systems
GEOG 452 Problems of Rural Land Use
CIV E 342 Transport Principles and Applications
CIV E 343 Traffic Engineering
CIV E 344 Urban Transport Planning
ECON 231 Introduction to International Economics
ECON 333 Interregional Economics
ECON 343 Urban Economics
ECON 345 Industrial Organization
ENV S 201 Introduction to Environmental and Planning Law
ENV S 402 Planning Law
PLAN 330 Urban Social Planning
PLAN 360 Technology in Urban and Regional Planning
PLAN 370 Land Development Planning
PLAN 414 Issues in Housing

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.

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, 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 far 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 of study 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 Advisor, 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, incoming students are expected to demonstrate proficiency in written English through the English Language Proficiency Examination offered by the English Department at the start of the fall term. 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, it is highly...
cumulative overall average of 65.0 and 70.0 in subsequent courses and must obtain credit standing in 12 term courses each 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 term courses as follows: Year One - 12 term courses; Year Two - 24 term courses; Year Three - 38 term courses; Year Four - 48 term courses.

Students may be granted conditional standing at the discretion of the School, which would permit 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
All required program courses are to be taken in the year indicated unless special permission is granted by the Undergraduate Officer. Year One students must select courses from first year level. Students in the Planning School are (normally) expected to carry a minimum load of 12 term courses in each of the four years of the program. However, students interested in taking extra courses are free to take a seven term course load in any given term without approval from the School; preregistration for more than seven term courses may only be done with the Undergraduate Officer’s approval. Students who have accumulated more than the required minimum number of term courses for proceeding into the next year of the program may elect to reduce the load and will be permitted to take a minimum of ten term courses in any given academic year through Year Four.

3. Admission to Year Two
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 12 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 12 term courses each year of the program.

4. 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. Planning students interested in completing an Economics Minor must complete ten term courses in Economics as follows: ECON 101, 102, 201, 202, 231 and one of ECON 211 or 221 (or equivalent approved by the Department of Economics); and at least four of: ECON 241, 233, 335, 341, 343, 345, 353, 355.

5. First-year Term Courses
No more than 16 first-year level term courses will be allowed toward the 48 required to graduate.

6. Readings and Research Course
A student wishing to register for a readings and research course (Planning 275, 475A/B) must first make arrangements with a Faculty member to provide the necessary supervision and guidance.

7. PLAN 307 may be taken in Year Two or Year Three provided that the ENV S 178 prerequisite has been met.

8. The School reserves the right to make changes to the curriculum as necessary. Please consult the School prior to registration.

9. Where a student in second year selects two of: 232, 259 and 270 and then picks up the third option - that third course will be considered a second-year theme elective.

10. Where a student in third year selects two of: 301, 357 and 330 and then picks up a third option - that third course will be considered a third-year theme elective.
11. Upper-Year Theme Courses
Regarding second, third and fourth year theme courses, students are required to have one credit from Year Two, two credits from Year Three and one credit from Year Four by graduation. The order of the courses taken may be altered if necessary but not the number of credits.

A variety of items are covered in the Undergraduate Studies Policy Manual available from 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></th>
</tr>
</thead>
<tbody>
<tr>
<td>ARTS 000, PLAN 100 A and B, PLAN 159</td>
<td>Electives</td>
</tr>
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<table>
<thead>
<tr>
<th>Year Two</th>
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</thead>
<tbody>
<tr>
<td>Fall Term 2A</td>
<td>ENV S 178, ENV S 200, PLAN 256A, PLAN 231</td>
</tr>
<tr>
<td>Winter Term 2B</td>
<td>PLAN 255, PLAN 256B and at least two of: PLAN 232, PLAN 259, PLAN 270</td>
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<td>Electives</td>
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</table>

<table>
<thead>
<tr>
<th>Spring Work Term 1</th>
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<table>
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<tr>
<th>Year Three</th>
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<tbody>
<tr>
<td>Fall Term 3A</td>
<td>PLAN 300A, PLAN 307 and at least one of: PLAN 301, PLAN 357</td>
</tr>
<tr>
<td>Winter Work Term 2</td>
<td></td>
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<tr>
<td>Spring Term 3B</td>
<td>PLAN 300B, PLAN 330</td>
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<td>Electives</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Year Four</th>
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</thead>
<tbody>
<tr>
<td>Fall Work Term 3</td>
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</tr>
<tr>
<td>Winter Term 4A</td>
<td>PLAN 456A, PLAN 480A, PLAN 490A</td>
</tr>
<tr>
<td>Electives</td>
<td></td>
</tr>
<tr>
<td>Spring Work Term 4</td>
<td></td>
</tr>
<tr>
<td>Fall Term 4B</td>
<td>PLAN 456B, PLAN 480B, PLAN 490B</td>
</tr>
<tr>
<td>Electives</td>
<td></td>
</tr>
</tbody>
</table>

For complete listing of electives, see Department Undergraduate Manual.
## Environmental Studies
### Urban and Regional Planning

### Honours Urban and Regional Planning Recommended Program (Regular and Co-op)

<table>
<thead>
<tr>
<th>YEAR ONE</th>
<th>Required Planning Courses</th>
<th>Theme Elective Courses</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Plan 100A Introduction to Urban Planning Concepts and Techniques 1</td>
<td>One term course from each of the eight categories in the list of Year One Theme Elective Courses (see below). Before making a final selection in these courses, students should check that prerequisites have been covered for courses which they might take in Years Two, Three and Four.</td>
<td>Students may select other electives from any of the University Year One offerings – Required and Elective Courses together must total 12 term courses – all courses to be at the first year level.</td>
</tr>
<tr>
<td></td>
<td>PLAN 100B Introduction to Urban Planning Concepts and Techniques 2</td>
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<tr>
<td></td>
<td>PLAN 159 Graphics for Planning</td>
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<td></td>
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<tr>
<td></td>
<td>ARTS 000 Y English Language Proficiency Exam</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Year One Theme Elective Courses

#### Theme Areas

The following courses are examples of Theme Electives:

1. **BIOPHYSICAL**
   - BIOL 111 Introductory Biology 1
   - EARTH 121 Introductory Geology 1
   - GEOG 102 Introduction of Physical Geography

2. **PSYCHO-SOCIAL**
   - SOC 101 Introduction to Sociology

3. **ECONOMIC**
   - ACC 121 Understanding and Using Financial Accounting Information
   - ECON 101 Introduction to Microeconomics
   - ECON 102 Introduction to Macroeconomics

4. **POLITICS**
   - P SCI 101 Introduction to Politics 1
   - P SCI 102H Citizen Participation in Canada
   - P SCI 102M Contemporary Issues in Canadian Public Policy

5. **PHILOSOPHY**
   - HIST 105 The Meaning of Civilization
   - PHIL 130J Philosophy of Discontent
   - PHIL 145 Critical Thought
   - P SCI 102F Political Rights and Obligations

6. **METHODS**
   - ENV S 178 Introduction to Environmental Research Methods

7. **THE ARTS**
   - ANTH 102B Anthropology Through Science Fiction
   - ARCH 194 Visual Interdisciplinary Language
   - ENGL 108 Themes of Literature (any one)

8. **OTHER THEMES**
   - ENV S 111 Introduction to the Study of the Future
   - ENV S 195 Introduction to Environmental Studies
   - GEOG 101 Introduction to Human Geography

*For a complete listing of Theme Electives, see Department Undergraduate Manual.*
### YEAR TWO

#### Required Planning Courses
- ENV S 200 Field Ecology
- ENV S 278 Advanced Environmental Research Methods
- PLAN 231 Citizen Involvement Planning and Social Change
- PLAN 255 Planning Surveys and Analyses, PLAN 256A Principles of Environmental Design

#### Theme Elective Courses
- Two term courses from list of Second Year Theme Elective Courses (see below).

#### Note
- Required and Elective Courses together to total 12 term courses.

### Year Two Theme Elective Courses

The following courses are examples of Theme Electives:

1. **URBAN THEME**
   - ARCH 223 Human Ecology
   - GEOG 225R Urbanization in the Third World
   - GEOG 251 Cities in Canada

2. **REGIONAL THEME**
   - GEOG 225R Urbanization in the Third World
   - PLAN 222 Canadian Regional Issues
   - PLAN 230 The Small Group in the Planning Process

3. **RURAL/RESOURCE THEME**
   - BIOL 250 Ecology
   - ERS 218 Canadian Energy Issues
   - SCI 250 Environment Geology

4. **ALL THEMES**
   - ENV S 201 Introduction to Environmental and Planning Law
   - ERS 241 Introduction to Environmental and Social Impact Assessment

For a complete listing of Theme Electives, see Department Undergraduate Manual.

### YEAR THREE

#### Required Planning Courses

#### Theme Elective Courses
- Four term courses from list of Third Year Theme Elective Courses (see below).

#### Note
- Required and Elective Courses together to total 12 term courses.

### Year Three Theme Elective Courses

The following courses are examples of Theme Electives:

1. **URBAN THEME**
   - ECON 343 Urban Economics
   - GEOG 349 The City as a System
   - PLAN 360 Technology in Urban and Regional Planning

2. **REGIONAL THEME**
   - GEOG 350 Regional Urban Systems
   - PLAN 319 Economic and Social Techniques for Regional Planning
   - PLAN 333 The Sociology of Regional Planning
Environmental Studies
Urban and Regional Planning

3. RURAL/RESOURCE THEME
- ECON 357: Environmental Economics
- GEOG 315: Agricultural Geography
- ERS 320: Environmental Economics
- ERS 351: Organizations and Environmental Management

4. ALL THEMES
- GEOG 352: The Rural-Urban Fringe of Canadian Studies
- PLAN 316: Multivariate Statistics
- PLAN 317: Nonparametric Statistics

For a complete listing of Theme Electives, see Department Undergraduate Manual.

<table>
<thead>
<tr>
<th>YEAR</th>
<th>Required Planning Courses</th>
<th>Theme Elective Courses</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>FOUR</td>
<td>PLAN 456A Political and Administrative Processes in Urban and Regional Planning 1, PLAN 456B Political and Administrative Processes in Urban and Regional Planning 2, PLAN 480A: The Philosophy and Methodology of Urban and Regional Planning 1, PLAN 480B: The Philosophy and Methodology of Urban and Regional Planning 2, PLAN 490A/PLAN 490B: Senior Honours Essay (the equivalent of four term courses).</td>
<td>Two term courses from list of Fourth Year Theme Elective Courses (see below).</td>
<td>Required and Elective Courses together to total 12 term courses.</td>
</tr>
</tbody>
</table>

Year Four Theme Elective Courses

The following courses are examples of Theme Electives:

1. URBAN THEME
- PLAN 414: Issues in Housing
- PLAN 420: Health, Environment and Planning
- REC 410: Planning of Recreation Facilities

2. REGIONAL THEME
- GEOG 412: Alternative Future Environments 2
- GEOG 450: City and Regional Systems
- PLAN 434: Planning with Native Peoples

For a complete listing of Theme Electives, see Department Undergraduate Manual.
Faculty of Human Kinetics and Leisure Studies
Faculty of Human Kinetics and Leisure Studies

The Faculty of Human Kinetics and Leisure Studies was officially formed in the Fall of 1972. This Faculty has gradually evolved from the School of Physical and Health Education (1966-67) and the School of Physical Education and Recreation (1966-72). Within this Faculty, the Department of Health Studies, the Department of Kinesiology, the Department of Recreation and Leisure Studies, and the Dance Group offer academic programs and conduct research.

The programs of the Faculty have developed rapidly in response to student needs and interests and to the changing needs and demands of society. Ten years ago a Regular stream was added to the Co-operative program to enable students who wanted the programs, but not the Co-operative aspects, to attend the University of Waterloo. At the same time elective courses were introduced into each department making it possible for students to pursue in some depth a specific area of Kinesiology, Dance, Health Studies or Recreation and Leisure Studies in which they had a special interest. The future promises even greater opportunities for specialized study by the individual students.

Dance Program

The programs in Dance offer students the unique opportunity of studying dance from the perspectives of the humanities and the social sciences, as well as that of the performing arts. This orientation represents a marked departure from the strictly performance-oriented approach which is taken in most programs of Dance at universities in Canada and the United States. Career choices for graduates include positions as dance critics, choreographers, company managers, performers and teachers.

Health Studies Program

Students in the Health Studies program examine important health problems and their causes. Of primary interest are diseases in which behaviour is an important contributing cause, such as lung cancer and smoking or heart disease and diet. 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 Program

The Kinesiology Program permits the student to study, in depth, the science of human movement. The course offerings are not found elsewhere. A primary feature of the program is the breadth and depth of preparation in the 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 courses including practica in sports medicine and cardiac rehabilitation, project-oriented courses in biomechanics and 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. 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 Program

The academic program in Recreation and Leisure Studies has been designed to give each graduate the body of knowledge necessary to prepare for a professional position in the field of Recreation and Leisure Studies. Students completing the Honours Degree program can, in addition, complete course sequences resulting in a specialization in Cultural Recreation, Leisure and the Humanities, Outdoor Recreation and Parks, Tourism and Commercial Recreation, Urban and Municipal Recreation, Human Development and Therapeutic Recreation, and...
Management in Recreation and Leisure Services. Joint Honours Programs are available with Geography, Man-Environment Studies, Kinesiology, Psychology, Social Development Studies, Sociology, Music, and Dance. Graduates of the Recreation and Leisure Studies Degree program are found in diverse settings, including hospitals, private agencies, municipalities, schools, national and provincial parks, youth agencies, and university graduate programs.

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 awarded 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.

Graduates who have pursued their studies in a Co-operative program and who have successfully completed four work terms, four work reports, and who indeed do finish 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 first 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-ordination and Placement 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 Human Kinetics and Leisure Studies.

Application from Ontario Secondary Schools
Applicants to the Health Studies program are required to select a university-entrance level program which includes Chemistry and Biology.

Applicants to the Kinesiology programs are required to include one Grade 13 or Ontario Academic Course credit from Algebra, Calculus, and Relations and Functions and two Grade 13 or Ontario Academic Course credits from Biology, Chemistry, and Physics. See Chapter 2 regarding anticipated changes to admission requirements.

Advanced Standing
Normally, students transferring to HKLS programs from other universities are granted credit for courses in which they have received a grade of C- or better. All transfer students will be required to complete at least the equivalent of two years of study at Waterloo (i.e. at least 22 term courses) 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 HKLS. Details are available from the Department of Co-ordination and Placement.

Students transferring to the Faculty of Human Kinetics and Leisure Studies 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 of 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 Human Kinetics and Leisure Studies feels that a student in any of the programs should be able to demonstrate competency in writing before qualifying for a degree. Therefore, all students entering an HKLS program must write the 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:

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. At the discretion of the chairman of the department 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. 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 re-read.
   d) Examination results are issued to individual students by the Registrar. Appeals against faculty decisions made under these regulations should be made in writing to the Associate Chairman, Undergraduate Affairs, of the student's major department, within one month of publication of the official mark reports.
   e) Students who are readmitted after being required to withdraw may choose to have their average cleared. See page 11:3 regarding transfer credit options.

The following cumulative averages are required to proceed in the programs of the Faculty:

<table>
<thead>
<tr>
<th>Program</th>
<th>Overall</th>
<th>Major Field</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kinesiology Honours</td>
<td>63</td>
<td>67</td>
</tr>
<tr>
<td>Health Studies Honours</td>
<td>63</td>
<td>67</td>
</tr>
<tr>
<td>Kinesiology General</td>
<td>53</td>
<td>60</td>
</tr>
<tr>
<td>Recreation Honours</td>
<td>65</td>
<td>70</td>
</tr>
<tr>
<td>Dance Honours</td>
<td>63</td>
<td>67</td>
</tr>
<tr>
<td>Dance General</td>
<td>60</td>
<td>63</td>
</tr>
</tbody>
</table>

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, the decision on his/her grade report may be changed. After eight months grades of INC, NMR, and DNW become grades of F−.
Program Selection

Full-time students: All first-year students normally take five term courses in both Fall and Winter terms. In subsequent terms, a student will normally take at least five term courses.

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 Human Kinetics and Leisure Studies 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 22 term courses while enrolled in full-time study (i.e. minimum of five courses per term) in the Faculty of Human Kinetics and Leisure Studies. In the case of students who have been granted the equivalent of one year of advanced standing, the HKLS 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 HKLS program must be completed in six years. The Faculty of Human Kinetics and Leisure Studies does not encourage part-time studies but will allow a General degree to 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. The Associate Chairman may approve up to five term courses (or equivalent). Requests for approval for additional courses must go to the HKLS 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 Human Kinetics and Leisure Studies, 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
Correspondence courses are normally restricted to part-time students who are not able to attend classes on campus. Correspondence courses may, under some circumstances, be taken while on a work term. The Associate Chairman 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
a) 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.
b) After the first two weeks of classes any course may be dropped provided the course instructor initials the drop, and either the Associate Chairman 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 Winter term and July 1 in 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.
c) 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 Chairman, Undergraduate Affairs.
d) Students should note the financial implications of dropping courses or withdrawing from programs (see page 3:3).

Appeals
Students who wish to appeal a grade received for a course should:
i) Contact the instructor associated with the course and attempt to resolve it within one month of the release of grades.
ii) If the student is not satisfied with the discussion, then a written appeal (HKLS Appeal forms can be picked up at each Associate Chairman’s Office) to the Associate Chairman, Undergraduate Affairs of the student’s home department can then be made. This appeal will be reviewed and a decision given by the Associate Chairman.
iii) An unfavourable ruling at the departmental level can be appealed in writing through the Associate Dean of the Faculty, to the HKLS Undergraduate Affairs Committee.
iv) An unfavourable ruling from the HKLS Undergraduate Affairs Committee can be appealed in writing to the Dean of the Faculty of HKLS.

Human Kinetics and Leisure Studies
Program Selection
Academic Programs
Dance

v) An unfavourable ruling from the Dean of HKLS can be appealed in writing to the Academic Vice President of the University.

Academic Programs

Dance

The unique Dance program at the University of Waterloo enables students to pursue dance as an entire field of both academic and applied study. The major perspective of Dance offered through the Bachelor of Arts degree program is Dance as a Theatre Art.

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 one of two areas of concentration.

Areas of Concentration (AOC)
The Historical-Cultural 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 influenced its development.

The other area of concentration deals with Developmental Foundations in dance. This 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.

Joint Honours Degrees
Joint Honours degrees are available with History, Psychology, and Recreation and Leisure Studies. Requirements in the Joint Honours Programs vary and students should consult with the Undergraduate Officer in both departments regarding course sequences, course or credit requirements, minimum averages and required courses.

Minors
A Minor is a group of approved courses taken by an Honours student in a subject area outside of Dance. Minors are available in most departments. Students interested in pursuing a Minor should consult with the Department offering the Minor.
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
A) Required Dance Courses
- DANCE 110, 111, 220, 230, 231, 233, 336, 410, 411
- Two of DANCE 241, 341 or DANCE 242, 342
- One of DANCE 351, 353
- Four of DANCE 221, 225, 234, 325, 333, 343 or DANCE 284, 366, 367, 484

B) Required Outside Courses
- Two of MUSIC 100, 111 or MUSIC 150G, 151G
- PSYCH 101; ANTH 102A
- Two of ENGL 106, 110, 14OR, 141R, 150, 151, 210C
- Six courses in AOC

C) Dance Electives
- Six term courses in Dance.

D) Other Electives
- At least five of the ten term course electives must be taken within the Faculty of Arts.

Suggested Course Sequence

<table>
<thead>
<tr>
<th>Year One</th>
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<tbody>
<tr>
<td>DANCE 110</td>
<td>DANCE 111</td>
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<tr>
<td>DANCE 230</td>
<td>DANCE 231 or 233</td>
</tr>
<tr>
<td>MUSIC 100 or 150G</td>
<td>MUSIC 111 or 151G</td>
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<tr>
<td>PSYCH 101</td>
<td>ANTH 102A</td>
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<tr>
<td>DANCE Elective</td>
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<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>DANCE 241 or 242</td>
<td>DANCE 341 or 342</td>
</tr>
<tr>
<td>DANCE 220</td>
<td>DANCE 231 or 233</td>
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<tbody>
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<td>DANCE 351 or 353</td>
</tr>
<tr>
<td>Required DANCE</td>
<td>Required DANCE</td>
</tr>
<tr>
<td>Required AOC</td>
<td>Required AOC</td>
</tr>
<tr>
<td>DANCE Elective</td>
<td>DANCE Elective</td>
</tr>
<tr>
<td>Elective</td>
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<table>
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<tbody>
<tr>
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<td>DANCE 411</td>
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<tr>
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<tr>
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<td>DANCE Elective</td>
</tr>
<tr>
<td>Elective</td>
<td>Elective</td>
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</tbody>
</table>

General Bachelor of Arts Degree Program
A) Required Dance Courses
- DANCE 110, 111, 220, 230, 231, 233, 336
- Two of DANCE 241, 341 or DANCE 242, 342
- One of DANCE 351, 353

B) Required Outside Courses
- Two of MUSIC 100, 111 or MUSIC 150G, 151G
- PSYCH 101; ANTH 102A
- Two of ENGL 109, 110, 14OR, 141R, 150, 151, 210C

C) DANCE Electives
- Five term courses in DANCE

D) Other Electives
- At least four of the nine term course electives must be taken within the Faculty of Arts.

Suggested Course Sequence

<table>
<thead>
<tr>
<th>Year One</th>
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</thead>
<tbody>
<tr>
<td>DANCE 110</td>
<td>DANCE 111</td>
</tr>
<tr>
<td>DANCE 230</td>
<td>DANCE 231 or 233</td>
</tr>
<tr>
<td>MUSIC 100 or 150G</td>
<td>MUSIC 111 or 151G</td>
</tr>
<tr>
<td>PSYCH 101</td>
<td>ANTH 102A</td>
</tr>
<tr>
<td>DANCE Elective</td>
<td>DANCE Elective</td>
</tr>
<tr>
<td>Elective</td>
<td>Elective</td>
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<table>
<thead>
<tr>
<th>Year Two</th>
<th></th>
</tr>
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<tbody>
<tr>
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<tr>
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<td>Required ENGL</td>
</tr>
<tr>
<td>Arts Elective</td>
<td>DANCE Elective</td>
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<tr>
<td>Elective</td>
<td>Arts Elective</td>
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<table>
<thead>
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<th>Year Three</th>
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<td>DANCE 351 or 353</td>
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<td>Required AOC</td>
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<td>DANCE Elective</td>
</tr>
<tr>
<td>Elective</td>
<td>Elective</td>
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</tbody>
</table>

Technique Courses
Technique is a highly valuable tool for students in all areas of dance. Ballet and Modern Dance Techniques are offered from beginning to advanced levels. Students may pursue these classes to the technical level of their interest and need. All technique courses have a credit weight of .25. Dance students may apply technique credits to the "Other Electives" section of their degree.

Note
Students enrolled in the B.A. (Hons) should select courses appropriate to the Historical-Cultural or the Developmental Foundations area of concentration (AOC) in consultation with a faculty advisor.
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 - introductions 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 44 term courses including the following requirements:

Degree Requirements


b) Required Kinesiology Courses: (three) KIN 222, 317, 330

c) Required Courses from other departments: (nine) BIOL 230, 233, 239 CHEM 123, 124 (plus 123L, 124L) CS 316 PSYCH 101; SOC 101

d) 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, 330, 350, 441, 455 HLTH 350, 407

e) Free electives: 12 term courses selected in consultation with the student’s advisor. *If 433 option taken, an additional elective, presumably at the fourth-year level and approved by the student’s advisor, is required.

Course Sequence

Regular Program

Year One (Co-op and Regular)

<table>
<thead>
<tr>
<th>Fall</th>
<th>Winter</th>
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<tbody>
<tr>
<td>HLTH 101</td>
<td>HLTH 102</td>
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<tr>
<td>SOC 101</td>
<td>PSYCH 101</td>
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<td>CHEM 124</td>
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<td>CHEM 124L</td>
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Year Two

<table>
<thead>
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<th>Winter</th>
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<tbody>
<tr>
<td>HLTH 220</td>
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<td>BIOL 239</td>
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<tr>
<td>KIN 222</td>
<td>HLTH 210</td>
</tr>
<tr>
<td>KIN 317</td>
<td>KIN 330</td>
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<tr>
<td>One Elective</td>
<td>Two Electives</td>
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Year Three

<table>
<thead>
<tr>
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<th>Winter</th>
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<tbody>
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<td>HLTH 341</td>
<td>HLTH 340</td>
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<tr>
<td>HLTH 349</td>
<td>HLTH 344</td>
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<tr>
<td>Four Electives</td>
<td>HLTH 348</td>
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<tr>
<td></td>
<td>CS 316</td>
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<tr>
<td></td>
<td>Two Electives</td>
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Year Four

<table>
<thead>
<tr>
<th>Fall</th>
<th>Winter</th>
</tr>
</thead>
<tbody>
<tr>
<td>HLTH 431 or 433</td>
<td>HLTH 432 or elective</td>
</tr>
<tr>
<td>HLTH 442</td>
<td>HLTH 443</td>
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<tr>
<td>Three Electives</td>
<td>HLTH 445</td>
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<tr>
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<td>Two Electives</td>
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</table>

Co-operative Program

Year Two

<table>
<thead>
<tr>
<th>2A (Fall)</th>
<th>2B (Spring)</th>
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</thead>
<tbody>
<tr>
<td>HLTH 220</td>
<td>HLTH 346</td>
</tr>
<tr>
<td>HLTH 245</td>
<td>HLTH 348</td>
</tr>
<tr>
<td>KIN 222, 317</td>
<td>HLTH 349</td>
</tr>
<tr>
<td>One Elective</td>
<td>KIN 330</td>
</tr>
<tr>
<td></td>
<td>BIOL 239</td>
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</table>

Year Three

<table>
<thead>
<tr>
<th>3A (Winter)</th>
<th>3B (Fall)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HLTH 210</td>
<td>HLTH 341</td>
</tr>
<tr>
<td>HLTH 340</td>
<td>HLTH 433 or elective</td>
</tr>
<tr>
<td>HLTH 344</td>
<td>HLTH 442</td>
</tr>
<tr>
<td>CS 316</td>
<td>Three Electives</td>
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<tr>
<td>Two Electives</td>
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</tr>
</tbody>
</table>

Human Kinetics and Leisure Studies
Health Studies
There are significant numbers of students within Human Kinetics and Leisure Studies 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:

A) 44 term courses including:
   - Kinesiology required courses:
     KIN 102, 103, 200, 222, 252, 255, 300, 317, 321, 330, 335, 354, 431/432 or 433*, 470.
   - Health Studies required courses:
     HLTH 101, 102, 245, 341, 348, 349, 442, 445
   - Outside Required:
     BIOL 230, 233, CHEM 123, 124 (plus 123L, 124L), CS 102, 105, MATH 106, PHYS 103, PHYS 105, PSYCH 101, SOC 101

   *Scientific or Data Analysis Division

   Electives:
   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.

   "If 433 option taken, an additional elective presumably at the 4th-year level and approved by the student's advisor, is required.

B) An overall average and major average of 70% is required in the Joint Honours program.

Course Substitution
In the case of PHYS 103 and MATH 106 students may elect to take full-year courses in either subject in the appropriate department.

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.
**Course Sequence**

**Honours and General Program**

<table>
<thead>
<tr>
<th>Year One</th>
<th></th>
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</tr>
</thead>
<tbody>
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<td><strong>Fall</strong></td>
<td><strong>Winter</strong></td>
<td><strong>KIN 102</strong></td>
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<tr>
<td></td>
<td></td>
<td><strong>KIN 103</strong></td>
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<tr>
<td></td>
<td></td>
<td><strong>BIOL 230</strong></td>
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<tr>
<td></td>
<td></td>
<td><strong>MATH 106</strong></td>
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<td></td>
<td></td>
<td><strong>PSYCH 101</strong></td>
</tr>
</tbody>
</table>

*Students may choose a computer science course in place of an Elective in Year One. If a computer science course is not chosen in Year One it must be completed by the end of 3A or 3N.*

**Regular Program**

<table>
<thead>
<tr>
<th>Year Two</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
<td><strong>Winter</strong></td>
<td><strong>KIN 200</strong></td>
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<tr>
<td></td>
<td></td>
<td><strong>KIN 222</strong></td>
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<td></td>
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<td><strong>SOC 101</strong></td>
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<td></td>
<td></td>
<td><strong>PHYS 105</strong></td>
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<tr>
<td></td>
<td></td>
<td><strong>Elective</strong></td>
</tr>
</tbody>
</table>

**Year Three**

| Fall | Winter | KIN 300 | KIN 330† |
|      |        | KIN 317 | Five Electives |
| Five Electives |  |  |  |

**Year Four**

| Fall | Winter | KIN 431† or 433† | KIN 470† |
|      |        | Five Electives | Five Electives |
|  |  |  |  |

**Co-operative Program**

<table>
<thead>
<tr>
<th>2A Fall</th>
<th>2B Spring</th>
<th>KIN 200</th>
<th>KIN 252</th>
</tr>
</thead>
<tbody>
<tr>
<td>KIN 222</td>
<td>KIN 300</td>
<td>SOC 101</td>
<td>KIN 321</td>
</tr>
<tr>
<td>PHYS 105</td>
<td>KIN 335</td>
<td>Elective</td>
<td>KIN 330†</td>
</tr>
<tr>
<td></td>
<td>KIN 354</td>
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<td></td>
</tr>
<tr>
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<td>3B Fall</td>
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<td>Four Electives</td>
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</tr>
<tr>
<td>4A Spring</td>
<td>4B Winter</td>
<td>KIN 431 or KIN 433</td>
<td>KIN 470†</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Five Electives</td>
<td>Five Electives</td>
</tr>
</tbody>
</table>

**Note**

All students in Year One are Honours students.  
†for Honours students only.

### Human Kinetics and Leisure Studies

**Kinesiology**  
**Recreation and Leisure Studies**

### Joint Honours Degrees

Joint Honours degrees with Recreation and Leisure Studies, Psychology, and Economics are available in addition to that with Health Studies (p. 11.8). Students should consult with the Undergraduate Officer in both departments regarding specific course sequences, course or credit requirements, and minimum averages.

### Department of Recreation and Leisure Studies

The Recreation and Leisure Studies program contains a core of courses in leisure studies, research, and management. Recreation and Leisure Studies electives provide the student with the opportunity to specialize in an Area of Concentration which reflects a desired academic and career path.

### Degree Requirements

**A) Recreation courses (22):**

1. **Required (12):**

   - REC 100, 210, 220, 230, 250, 270A, 300 or 301 or 305, 320, 371A, 429, 470, and 471.

2. **Recreation Electives (ten):**

   - Each student must complete additional Recreation electives to meet the required total of 22 Recreation courses.

**B) Courses outside the Department of Recreation and Leisure Studies:**

1. **Required: (nine)**

   - PSYCH 101 and SOC 101
   - Any two sequential English courses: 109 & 110; or 140 & 141; or 150 & 151; or 209 & 210.
   - CS 100. Students with a background in CS, with the approval from the Undergraduate Chairman, may take CS 102 in its place.
   - Select one course from four of the following seven categories (Restricted Electives):
     a) BUS 121W  
     b) ECON 101  
     c) A Fine Arts or Performing Arts course  
     d) GEOG 101 or ENV S 195  
     e) A Science Faculty course  
     f) A Health Studies or Kinesiology course  
     g) A Political Science or History course

2. **Non Recreation Electives: (13)**
### Course Sequence

#### Year One (Co-op and Regular)

<table>
<thead>
<tr>
<th>Fall</th>
<th>Winter</th>
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</thead>
<tbody>
<tr>
<td>REC 100, 250</td>
<td>REC 210, 230</td>
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<tr>
<td>One of ENGL 109, 140, 150 or 209</td>
<td>One of ENGL 110, 141, 151 or 210</td>
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<td>PSYCH 101</td>
</tr>
<tr>
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#### Regular Program

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</thead>
<tbody>
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<td>Fall</td>
<td>Winter</td>
</tr>
<tr>
<td>REC 220, 300*, 301*</td>
<td>REC 270A</td>
</tr>
<tr>
<td>One Restricted Elective</td>
<td>Two Recreation Electives</td>
</tr>
<tr>
<td>One or Two Recreation</td>
<td>Three Non-Recreation Electives</td>
</tr>
<tr>
<td>Electives</td>
<td></td>
</tr>
<tr>
<td>Two Non-Recreation</td>
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<td>Electives</td>
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<thead>
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<tbody>
<tr>
<td>REC 320, 371A</td>
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<td>One Recreation Elective</td>
<td>Two or three Recreation</td>
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<tr>
<td>Electives</td>
<td>Electives</td>
</tr>
<tr>
<td>Two Non-Recreation</td>
<td>Two Non-Recreation Electives</td>
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<tr>
<td>Electives</td>
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<table>
<thead>
<tr>
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<th></th>
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<tbody>
<tr>
<td>REC 429, 470</td>
<td>REC 471</td>
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<tr>
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### Co-operative Program

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<tbody>
<tr>
<td>2A (Fall)</td>
<td>2B (Spring)</td>
</tr>
<tr>
<td>REC 220, 300*, 301*</td>
<td>Three Recreation Electives</td>
</tr>
<tr>
<td>One Restricted Elective</td>
<td>Three Non-Recreation Electives</td>
</tr>
<tr>
<td>One or Two Recreation</td>
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<tr>
<td>Electives</td>
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<tr>
<td>Two Non-Recreation</td>
<td>Two Non-Recreation Electives</td>
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<td>Electives</td>
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<table>
<thead>
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<th>Year Three</th>
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</thead>
<tbody>
<tr>
<td>3A (Winter)</td>
<td>3B (Fall)</td>
</tr>
<tr>
<td>REC 270A, 305*</td>
<td>REC 320, 371A</td>
</tr>
<tr>
<td>One or Two Recreation</td>
<td>One Recreation Elective</td>
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<td>Electives</td>
<td>Two Non-Recreation Electives</td>
</tr>
<tr>
<td>Two Non-Recreation</td>
<td>Electives</td>
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<table>
<thead>
<tr>
<th>Year Four</th>
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</thead>
<tbody>
<tr>
<td>4A (Spring)</td>
<td>4B (Winter)</td>
</tr>
<tr>
<td>REC 429, 470</td>
<td>REC 471</td>
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<tr>
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<td>Two Recreation Electives</td>
</tr>
<tr>
<td>Electives</td>
<td>Two Non-Recreation Electives</td>
</tr>
</tbody>
</table>

### Areas of Concentration

Students may choose Recreation and Leisure Studies electives from the following Areas of Concentration:

- Cultural Recreation
- Leisure and the Humanities
- Outdoor Recreation and Parks
- Tourism and Commercial Recreation
- Urban and Municipal Recreation
- Human Development and Therapeutic Recreation
- Management in Recreation and Leisure Services

### Joint Honours Degrees

Joint Honours degrees are available with Geography, Man-Environment Studies, Kinesiology, Psychology, Social Development Studies, Sociology, Music, and Dance. 

### Options

An Option is a specified combination or grouping of courses which provides the student with another emphasis in a particular program.

### 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.

*Students must take one of REC 300 or 301 or 305.
Independent Studies Program
Independent Studies

An Opportunity for the Individual to Develop an Independent Program of Study

Independent Studies is a small undergraduate program formerly known as Integrated Studies. The program serves students who wish to create their own, self-directed, plan of study. In many cases these plans of study include a perspective that goes beyond that of a single discipline. Students enrolling in Independent Studies from high school must spend at least four terms in "pre-degree phase." During this time they study by working individually with I.S. Faculty or Professors, setting up and/or attending seminars, attending conferences and workshops, and perhaps taking courses. At the end of their pre-degree phase, they put together a degree project that they can complete in their final two terms in I.S., when they will be in "degree phase." Each student must find two non-I.S. University of Waterloo faculty supervisors to oversee this project, which must also be approved by the Academic Board of the program. If a student is transferring from another university program or coming back to university as a mature student, academic credits they have obtained before coming to I.S. may reduce their time of enrollment in I.S. to a minimum of four terms.

In addition to the emphasis on self-directed learning, Independent Studies has a tradition of student involvement in program administration and management. Besides creating a strong sense of community, this involvement ensures student input in decisions which maintain an environment conducive to independent study. Thus, there is some expectation that students will become involved in the various decision-making bodies of the program. These include Council, Executive Committee, Joint Committees (Review and Evaluation Personnel, and Admissions), and In-House Committees such as Compucom (Computers) and Space Committees.

Academic Director

A.I. Dagg, BA, MA, (Toronto), PhD (Waterloo)

The Academic Director of Independent Studies is a University faculty member who is responsible for administration of the program. She serves as a link between the program and the rest of the university community including the Academic Board. The Academic Director provides students with administrative assistance and academic counseling for their programs of study.

Anne Innis Dagg

Although she is now Academic Director, Anne continues to work academically with students at I.S. as she has for the past seven years. Since she has a PhD in biology, she has met with students interested in areas such as field ecology, the brain, human physiology, reproduction, and sociobiology. As a writer, she is involved with the Writers’ Workshop in which I.S. members bring their poems or stories to be discussed. As a feminist, she helps organize women’s groups and encourages discussion on such things as sexist language and women’s place in society. Because she has been involved in campus activities since 1959, she is able to direct students to many resources that should prove helpful to them.

Faculty

M. Constant, BSc (Toronto)

H. Huertas-Jourda, BA (Florida), MSc (Waterloo)

M. Lippincott, BA, MA (Delaware), PhD (Toronto)

J. Pauwels, Licenciate (Ghent), MA (Toronto), PhD (York)

H. Woodhouse, BA (Exeter), MA (McMaster), PhD (Toronto)

Maurice Constant

Maurice is an Adjunct Professor in the Department of Systems Design Engineering. In addition to engineering, his academic background includes the life sciences (physiology and biochemistry). Professionally, he is also a maker of documentary films and is engaged in projects with the CBC, TV Ontario, the National Film Board and the IMAX Corporation. He founded a Film Production Program at Conestoga College in 1968. As a consultant and designer, his work includes: pavilions at Expo ’67, an air traffic control system and a teleconferencing system for the Federal Government and a CAD (Computer Aided Design) system for the Ontario Government. Areas of interest include: human communications (interpersonal, cross-cultural, mass media, human-machine systems); computer-mediated human communication systems (Telidon, teleconferencing, automated office) and their impact on society; technology and society; computer graphics, computer animation and computer-generated sound; design methodology; the analytic and creative processes; aesthetics and design; history and philosophy of science; systems theory (the behaviour of complex systems, biological, social, industrial, political, ecological); environmental perception; major exhibition design; film and TV production.
Independent Studies
Independent Program of Study
Faculty

Heidi Huertas-Jourda

Heidi is primarily interested in the interface between mind, body, behaviour, and what we label as external to these. She explores this interest through her work as a marriage and family therapist, in work in dreams and imagery, and in explorations of the political and personal needs of women. Her focus is on the interdependence of the system and how a particular event can change the system. Heidi's background also includes working with gestalt, psychodrama, neurolinguistics, and women's groups. Other interests are alternative world views as expressed by Gary Zukov, Fritjof Capra, and Bruce Holbrook. Her current research is in the area of the science question in feminism and the study of semiotics.

Mark Lippincott

Mark has a doctorate in political theory, with minor areas in comparative politics, American politics and constitutional law. He takes an interdisciplinary approach to his primary interest in modern political movements, combining elements from ancient philosophy and myth, existentialism, Marxism, aesthetics, psychology and sociology. As well as academic teaching experience, Mark has worked as an editor/researcher for studies in school integration, a community health program and the Bertrand Russell Editorial Project. He has recently completed an essay on the ideology of power in 1984 for an anthology on George Orwell and he is currently working on a book entitled Albert Camus' Theory of Rebellion.

Jacques Pauwels

Jacques has a Licenciate Degree MA and a PhD in History as well as an MA in Political Science, and he is currently working on a Doctorate in the same field, specializing in Public Administration and Policy Analysis. In History his main interests concern social-economic and intellectual developments in Europe in the 19th and 20th centuries, and Nazi Germany in particular. He has published a book, Women, Nazis and Universities: Female University Students in the Third Reich (1984), as well as a number of articles, including one on certain aspects of the Canadian Role in World War II. As for Political Science, he is interested primarily in bureaucratic theory and practice (especially Max Weber's ideas on bureaucracy), neo-Marxist views of the state, and Canadian foreign investment policy; an essay of his on the Foreign Investment Review Agency (FIRA) was recently published in The Osgoode Hall Law Journal. Jacques would be pleased to work with students in these disciplines, and he is also prepared to help students with foreign language interests and needs, as he is fluent in French, German and Dutch, and has a solid background in Latin.

Howard Woodhouse

Howard has done graduate work in both philosophy and history and philosophy of education, holding a doctorate in the latter. He therefore welcomes students wishing to work in these and other areas. Howard is particularly interested in alternative education (such as I.S. itself), the history of educational thought, the impact of science on university and secondary education, and knowledge and its relation to social institutions in general. Before coming to I.S. Howard taught in an African university and has published numerous articles on African education, culture and dependency, which are ongoing interests of his. He considers one of his tasks as an Academic Advisor is to enable students to acquire the research tools and writing abilities desirable in their chosen disciplines. Vitally concerned about teaching, Howard also operates an educational consultancy service, one of whose aims is instrucational development. Howard is bilingual.

Approach to Resources

In designing their own studies, the students have access, not only to the Program's resources, but also to those of the community and the University, including its full array of courses. They decide which resources they require and what approach they wish to pursue. The students often work on an individual basis with faculty or graduate students from the many university departments or with people within the Program. They may audit several courses and take some for credit, or perhaps take no courses at all. An interest in community affairs leads some students to involvement in such areas as the court system, mental retardation and development centres, public and alternative schools, and environmental groups, to name but a few. In addition, they are also free to pursue studies privately utilizing the library and other facilities.

The diverse interests and perspectives in the Program's composition continually foster an enthusiastic exchange of information among the students and the Faculty. This activity has promoted a variety of seminars (for example, alternative education; political and legal issues; gender roles; French Conversation), ongoing meetings such as the Writers' Workshop and Women's Groups, and special film series.
Term-End Reviews
Students document the structure and pursuit of their studies as their programs develop. At the beginning of each term in their "pre-degree phase" they hand in a Term Plan which outlines what they plan to achieve during that term and how they plan to achieve it. At the end of each term they complete and hand in a Term Performance Report which describes what they actually accomplished. The Term Plans and Term Performance Reports are reviewed by the Review and Evaluation Committee which determines if the student is allowed to proceed in the program. Each student's Term Plans and Term Performance Reports, together with letters describing what other academic work he or she has completed while at I.S., provide an invaluable resource for the preparation of the degree project and the Description of Studies which is included in the B.I.S. Transcript package.

Length of Registration
Students in good standing may register in the Program for up to eight terms. Registration beyond these terms will be at the discretion of the Executive Committee.

Degree Process
While students may take and receive grades for regular university courses, the degree awarded is not based on an accumulation of course credits, but on an evaluation made by the Academic Board and the appointed supervisors during a formal candidacy period. The Bachelor of Independent Studies (B.I.S.) degree is a three-year general bachelor degree. However, each degree program is evaluated on its own merits.

Students who desire the degree and are ready for senior undergraduate work, present a written application to the Academic Board for Independent Studies documenting their level of achievement and their plans for their final degree period. The Board, consisting of faculty members of the University appointed by Senate, interviews the applicants to determine their preparedness for degree candidacy.

Accepted degree candidates then work under appointed supervisors (two of whom must be members of this University's faculty) for a minimum of two academic terms. During this time the candidates are required to present tangible evidence of their educational development to assist the supervisors with the evaluation of their total baccalaureate programs. At the end of this process the supervisors present letters of recommendation which serve as the basis for the Board's degree recommendation and form part of the student's academic transcript.

Current members of the Academic Board are:
R.H. Holmes, PhD (Philosophy) Chairman
P.E. Bowers, PhD (Psychology)
G.R. Francis, PhD (Environment & Resource Studies)
F. Mavaddat, PhD (Computer Science)
G.F. Rabideau, PhD (Systems Design)
N. Theberge, PhD (Kinesthetics)
J. Vanderkooy, PhD (Physics)

Examples of Individual Studies
Diane became so interested in drama while attending St. Lawrence College in Quebec, that she enrolled in Theatre/Production at Ryerson Polytechnic Institute. She continued to work in theatre after graduating from Ryerson until 1983, when she enrolled in I.S. During her first years here she worked with professors of history, anthropology and fine arts on costume history, decorations, and culture of native peoples. She also attended seminars on I.S. on film production and became familiar with the use of computers. Her B.I.S. project will address the specific question "How has Micmac clothing changed through recorded history?" and will discuss not only changes that occurred because of interactions with other tribes and with Europeans, but also what raw materials were used for clothing and decoration, and how clothing related to gender, age, and lifestyle. The information she collects for her thesis will be invaluable as a resource for costume designers involved with theatre about native people.

Jill spent three terms in the School of Architecture at the University of Waterloo before switching to I.S. She enjoyed the architecture courses, but found that they did not allow enough time to explore her areas of interest in depth. Since she has been at I.S., she has specialized in medieval and renaissance architectural history, taking courses in medieval history, Italian renaissance art, and in Latin. In 1985, she attended a conference at the Centre for Medieval Studies at the University of Toronto dealing with all aspects of medieval towns. Most of her time, however, has been spent in reading books dealing with her specialized area. She has been guided by a few of the I.S. Academic Advisors and by a professor of planning who will be one of the supervisors for her degree project. She has also discussed her work with professors at York University, Western, and the Pontifical Institute for Medieval Studies. Recently, she spent five weeks in England visiting medieval towns and archives.

Doug's academic career began when he retired two years ago. He joined the Air Force when he was young, and then had to earn a living, so he had never been able to attend university. Doug is interested in the effects, mental and physical, of aging in people. He believes that the quality of a person's life is important, no matter what his or her age. This ideal led him at age sixty to attempt and succeed at the triathlon athletic event. He now attends fitness classes at the Athletics Building for an hour three times a week. While at I.S., Doug has usually taken three courses, related to gerontology, a term, with extra work on topics that interest him. One such topic is the correlation of quality of sleep with depression. When he completes his academic work this year, he will
have both a Bachelor of Independent Studies degree and the Diploma in Gerontology.

Pat learned about Independent Studies while browsing among university calendars in Ottawa. She liked the idea of being able to design her own academic program, something she had not been able to do at high school. Because her long range interests centred on world food problems, especially those in the developing world, in her first year she has taken selected courses in economics, geography, environmental studies, history philosophy, and English. In addition, she has attended five seminars or groups offered in the I.S. program itself. Their subject areas were politics, pre-industrial Europe, systems design, film and video production, and women. She has found the small group discussions in I.S. to be an especially fruitful way of learning.

Before he came to I.S., Shane produced and directed a series of educational and documentary films in countries as far-ranging as Papua New Guinea, Panama, and the Solomon Islands. His interests had also encompassed the field of mental health and psychology, in which he had attended courses at universities in Canada, Brazil, and France. At I.S., he has combined these two areas in studying the use of motion pictures as an educational tool in the field of mental health. He has taken some courses at the university, written an undergraduate thesis, produced a half-hour video on psychotherapy, and worked for a term as a psychology intern in a mental health program in the United States.

I.S. has a new feature, that of students transferring into the program from another area of the campus for a term or two and then transferring out again. This enables them to study some area of interest in depth using our resources without working toward a B.I.S. degree. Teresa is the first person to take advantage of this option. Her studies at the University of Waterloo have lead her through two terms in the Co-op Accountancy program and five terms in a Philosophy and Russian program. She enjoyed her courses but found that several topics of special interest to her were not discussed in much depth. In preparation for her last year of studies, she felt that within her structured program of studies she had not been able to explore her interests as much as she desired. She therefore decided to transfer for several terms to the Independent Studies Program, where she is pursuing work in mysticism and spiritual healing. Eventually she plans to integrate what she has learned into her philosophy thesis.

Computing Facilities

The Independent Studies Program has access to all the facilities offered by the Department of Computing Services through five terminals situated within the program. Students may also use any of the many public terminals on campus. These facilities include the CMS or UNIX time-sharing networks supported by IBM and VAX equipment respectively. A small sample of these facilities includes word-processing, programming with all the languages supported by Waterloo, and data-base searches using SPIRES. The latter allows you to search the university's film library containing in excess of 44,000 entries. A similar service, WATMARS (Waterloo machine-assisted reference service), can be very useful when pursuing independent studies.

WATMARS is an online interactive retrieval system used to perform literature searches. The process takes about 30 minutes and costs about 45 dollars. It not only saves a good deal of time, but it is in many cases more comprehensive than any manual search. By carefully designing search strategies, you can search almost any topic imaginable.

In addition to these computer mainframe systems, the program also provides the students with two microcomputers. One is an IBM Personal Computer XT supplemented with graphics card, 10 megabyte hard disk and graphics printer. This unit is equipped with the coherent operating system supporting the "C" programming language as well as standard MS DOS. The other is a Macintosh Plus with 1 megabyte of RAM, 10 megabyte hard disk and an Apple image writer. The system is supported with a variety of software such as MacPaint, MacDraw, Microsoft Word and other useful utilities.

As a student in the program you can help decide what additional software is purchased for any of our computing equipment as well as what additional hardware is required.

Video Equipment

The program offers students an opportunity to use VHS video equipment to make a video production. The facilities are centred around a Hitachi VK-C870 camera and a five-head portable Hitachi video cassette recorder (VCR) with three lights, stands, and filters. Using the Zenith VCR and the Hitachi VCR together allows students to edit their work into a rough-cut video. The collection also includes high quality omni-directional and directional microphones and four lapel microphones. These can be mixed onto a single track or into stereo using our six-channel mixer. The program also offers students training in the use of this equipment and access to film courses or seminars on film production techniques.
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.

Admission Requirements

Students applying to the Program are required to complete the appropriate formal application form (See Chapter 2 of this Calendar), and submit academic transcripts from previous educational institutions. In addition, they must provide an autobiographical letter indicating:

1. their previous learning experience,
2. their reasons for wishing to enter Independent Studies, and
3. an indication of the type of exploration proposed.

Candidates should also submit letters of reference assessing their ability to pursue their proposed programs and to carry on independent study.

All applicants residing within a reasonable distance of the University are then interviewed by the Admissions Committee. Decisions on the remaining applicants are made solely on the submitted material.

Applicants with limited formal education are considered if they indicate an ability to handle university-level study and to work on their own.

Those interested in this alternative approach to university education are urged to visit the Program to meet with those currently involved in its operation. In addition, members of Independent Studies would be happy to visit schools or groups of students to discuss the Program.

For more information, including a copy of the current handbook, contact the Academic Director of the Independent Studies Program, at extension 2368, Room 1054, the Psychology, Anthropology and Sociology (PAS) Building or P. Burroughs, Registrar's Office, Needles Hall.
Faculty of Mathematics
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 Pass, four-year General and four-year Honours programs.

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. The Co-operative system is described in detail in Chapter 5. The Pass and General programs are not available in the Co-operative system. 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.

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 high 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 best qualified applicants. In the Faculty of Mathematics, since there are traditionally more qualified applicants than places available, the admissions process is basically a competition for these 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 evidence to indicate an exceptional aptitude and interest in Mathematics.

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, applicants should have covered the material in the three required Ontario Grade 13 or Ontario Academic Courses in mathematics (Calculus, Functions and Relations, Algebra), preferably through regular day school classes at a local high school, or alternatively through night school or summer school classes, or possibly by correspondence through the Correspondence Branch of the Ontario Ministry of Education. Applicants are also strongly encouraged to write the Descartes Mathematics Contest.

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 Grade 13 or Ontario Academic Course 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 high 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 Grade 13 or Ontario Academic Course marks, are described in detail in the Faculty of Mathematics brochure.)
admission. 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 very 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. Transfer Credits

Once students have been admitted to the Faculty of Mathematics, having transferred from outside or from within the University of Waterloo, they will normally be given transfer credit for relevant courses previously taken 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 course or in a 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 might 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. A maximum of 12 transfer half-credits per academic year previously taken will normally be given.

Students admitted with a previous Bachelor's degree will normally be given a maximum of 12 non-math half-credits, with a possibility of exemptions (but not degree credit) in certain math courses.

Note

Students transferring from other post-secondary institutions or other University of Waterloo faculties must successfully complete at least 12 University of Waterloo mathematics half-credits chosen from those courses which may be taken for credit by a student in the Faculty of Mathematics.

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.

Transfer applications for on-campus studies in Mathematics are considered only for Honours programs, and normally only for September admission. (Exceptions are usually made for students on a Co-op work term in the Fall, and such students will be considered for January admission.) 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 very competitive one. In recent years, the majority of students admitted have had consistent B grades or better in their previous University of Waterloo course work.

Application forms 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 must be received by the Registrar's Office no later than June 1 in order to guarantee consideration for September admission to Mathematics. 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

Applications for advanced-standing admission to on-campus studies in Mathematics from students at other post-secondary institutions are considered only for Honours programs, and normally only for September admission. 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 very 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. Transfer Credits

Once students have been admitted to the Faculty of Mathematics, having transferred from outside or from within the University of Waterloo, they will normally be given transfer credit for relevant courses previously taken 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 course or in a 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 might 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. A maximum of 12 transfer half-credits per academic year previously taken will normally be given.

Students admitted with a previous Bachelor's degree will normally be given a maximum of 12 non-math half-credits, with a possibility of exemptions (but not degree credit) in certain math courses.

Note

Students transferring from other post-secondary institutions or other University of Waterloo faculties must successfully complete at least 12 University of Waterloo mathematics half-credits chosen from those courses which may be taken for credit by a student in the Faculty of Mathematics.
4. Cumulative Averages
Grades in courses taken at the University of Waterloo prior to a student's admission to the Faculty of Mathematics will normally be included in overall and mathematics cumulative averages if the courses are ones that a student registered in the Math Faculty might take for credit toward a BMath degree. Otherwise, the grades are considered only for transfer credit purposes and not included in averages.

Grades in courses taken at other institutions prior to a student's admission to the Math Faculty will not be included in cumulative averages.

5. Co-operative Programs
It is normally not possible to transfer into a Co-operative program beyond the second-year level. Students applying for transfer 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. Past experience has indicated that very few places in Co-operative programs are available at the second-year level for students applying from other institutions. Applicants in this category 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.

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.

The BMath Pass degree may be obtained entirely by part-time studies; the BMath General degree requires at least two complete terms on campus; the BMath Honours degree requires at least four complete terms on campus, and many Honours programs normally require an additional four full-time terms of registration. (Please consult Footnote 7 on page 13:7 for a definition of "complete term".)

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 codes:

- Co-op (C.A. Option) – WN
- Co-op (including Computer Science) – WT
- Regular (including Computer Science) – WM

The WN category is exclusively for students wishing to pursue the Co-op Mathematics/Chartered Accountancy Option or Joint Honours Co-op Computer Science/Chartered Accountancy Option. All other students should apply to category WT (Co-op) or WM (Regular).

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 Actuarial Science
- 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 Non-Specialist Faculty 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 Non-Specialist 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 Teaching Option
- All Computer Science Major Programs (Co-op and Regular)

*At present the number of Co-op 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.

**Students who take a standard course load in first year (i.e. six courses per term) and successfully complete all twelve courses with math and overall averages in the high-60 range can be reasonably confident of admission to CS Major status for their 2A term. Approximately 300 students are admitted to CS Major programs each year.

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.

Programs which have had to restrict enrolment, or appear likely to, will be identified, as far as possible, on an on-going basis, and every reasonable effort will be made to publicize such changes to students who may be affected. Related information will be made available through the Mathematics Faculty Undergraduate Office during (pre)registration periods. Students will be expected to take such information into account when planning their courses of study.

**Applicants Holding Student Authorizations**

A maximum of 5% of the available freshman seats in the Faculty of Mathematics is open to qualified applicants who hold Student Authorizations (visas). [Please note that this quota on foreign student enrolment does not apply to Permanent Residents in Canada (landed immigrants).] This same 5% quota applies to all restricted enrolment Mathematics undergraduate Honours programs for which formal admission occurs beyond Year One (e.g. Computer Science Major Programs). By this approach the Faculty hopes to preserve an appropriate international mix in its undergraduate student population while responding to the demand for places from highly qualified Canadian students.

For complete information regarding the admission categories, requirements and procedures, consult Chapter 2 of this Calendar.

**Fees, Financial Assistance**

See Chapters 3 and 4.

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**Mathematics**

Admission

Academic Programs/

Degree Requirements

The Faculty of Mathematics offers undergraduate programs leading to the following Bachelor of Mathematics degrees: BMath Honours, BMath General, BMath Pass. The Honours program is designed primarily for full-time on-campus students who wish to pursue in-depth studies in the Mathematical Sciences. The General program, on the other hand, is more suitable for students with a definite interest in mathematics but who prefer more latitude in the depth and breadth of their course selection. The General program is also intended primarily for full-time on-campus students. The Pass program, by comparison, is a relatively non-specialized course of study intended primarily for part-time students, usually studying in the correspondence format, who want to pursue a more general education and include a larger proportion of non-math courses in their program. The Pass and General programs are available only to students in the Regular system of study.

The Honours Program is more demanding than either the General or Pass program. In addition to requiring that the Honours (or Advanced Honours) versions of Faculty core courses be taken, the required number of credits for an Honours degree is greater than the number for either a General or Pass degree. Further, the BMath Honours program requires higher graduating averages than the BMath General and Pass programs.

All full-time on-campus Mathematics freshmen take a common core Honours program in Year One, consisting of Algebra, Calculus, and Computer Science, plus three non-mathematics courses. This commonality of curriculum (which continues to a large extent into Year Two) permits considerable flexibility
for students to change from one academic program to another within the Faculty of Mathematics. In fact, if non-math courses are judiciously chosen, this flexibility for change can be extended to many programs in other faculties as well.

Tables I and II, on pages 13:7 and 13:8 respectively, and the accompanying footnotes outline in detail the common degree requirements and typical course load for each academic year (i.e. two four-month academic terms) of all undergraduate programs in the Faculty of Mathematics. Except where noted, Honours programs may be taken in either the Regular or Co-operative system of study. The Pass and General programs, however, are available only in the Regular system. The academic requirements of corresponding Co-operative and Regular programs are identical.

Additional requirements for Co-op students are summarized in a booklet, *Regulations and Procedures for Co-operative Programs*, available from the Department of Co-operative Education and Career Services in Needles Hall.

Under the Math Faculty's credit system, it is the student's responsibility to be aware of all regulations pertaining to his or her program of study. When all requirements for the particular BMath degree being sought have been met, it is the student's responsibility to submit an 'Intention to Graduate Form' to the Registrar's Office.
# Mathematics

## Degree Requirements

### Table I - Degree Requirements Common To All BMath Programs

<table>
<thead>
<tr>
<th>Minimum total half-credits</th>
<th>48 Half-Credit Honours Programs</th>
<th>44 Half-Credit Honours Programs</th>
<th>General Programs</th>
<th>Pass Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum math half-credits</td>
<td>24 - 30</td>
<td>22 - 28</td>
<td>24</td>
<td>12</td>
</tr>
<tr>
<td>Minimum non-math half-credits</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Minimum Graduating Math Average</td>
<td>65%</td>
<td>65%</td>
<td>60%</td>
<td>60%</td>
</tr>
<tr>
<td>Minimum Graduating Overall Average</td>
<td>65%</td>
<td>65%</td>
<td>60%</td>
<td>60%</td>
</tr>
<tr>
<td>Maximum course attempts</td>
<td>60 half-credits</td>
<td>56 half-credits</td>
<td>54 half-credits</td>
<td>44 half-credits</td>
</tr>
<tr>
<td>Maximum failures</td>
<td>six half-credits</td>
<td>six half-credits</td>
<td>eight half-credits</td>
<td>eight half-credits</td>
</tr>
<tr>
<td>Minimum complete terms required</td>
<td>four</td>
<td>four</td>
<td>two</td>
<td>none</td>
</tr>
<tr>
<td>Minimum full-time terms of registration</td>
<td>four, including the four complete terms required above</td>
<td>eight, including the four complete terms required above</td>
<td>two, including the two complete terms required above</td>
<td>none</td>
</tr>
<tr>
<td>Standard course load</td>
<td>six half-credits per term in Years One and Two; five half-credits per term in Years Three and Four</td>
<td>six half-credits per term in Year One; five half-credits per term thereafter</td>
<td>six half-credits per term in Year One; five half-credits per term thereafter</td>
<td></td>
</tr>
</tbody>
</table>

### English Writing Skills Requirement

All BMath degree candidates must satisfy an English Writing Skills Requirement. Please see section (6) on page 13:28 for details.

### Footnotes to Table I

1. 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).

2. The actual minimum number of math half-credits required for a BMath Honours degree varies from one program to another within the ranges specified in Table I above. Individual program requirements are included with the detailed program descriptions on pages 13:9 - 13:21.

3. Note that students transferring from other post-secondary institutions or other U of W faculties must successfully complete at least 12 University of Waterloo math half-credits chosen from those courses which may be taken for credit by a student in the Faculty of Mathematics.

4. The term 'non-math half-credit' refers to courses offered by other faculties as well as those with the course prefix MTHEL.

5. Both averages in i) and ii) exclude failures. If a passed course is repeated, only the better mark is considered. If a student successfully completes more than the minimum number of credits, the 'excess' ones with the lowest grades are excluded.

6. For the Honours Math/Accounting and Computer Science/Accounting Options, students must also achieve an average of at least 70% in all the courses with prefix ACC which are explicitly required for their program.

7. A 'course attempt' refers to a course registration not formally cancelled with the Registrar's Office before the drop deadline in the term in which the course is taken. Normally, the last day to ADD a course is two weeks after the official beginning of lectures. The last day to DROP a course for students not carrying more than a 'standard' (as defined in Table I above) 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.

8. If a student succeeds in a course, only the better mark is considered. If a student successfully completes more than the minimum number of credits, the 'excess' ones with the lowest grades are excluded.

9. A 'complete term' is normally one in which a student successfully completes at least five half-credits on campus, at least two of which must be math half-credits.

10. A 'full-time term of registration' is one in which a student's course load consists of at least three half-credits.
### Table II - Required Year One & Two Faculty Core Courses/Typical Course Loads

<table>
<thead>
<tr>
<th>Year</th>
<th>Honours Program</th>
<th>General Program</th>
<th>Pass Program</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Year One</strong></td>
<td>MATH 130A/B; MATH 134A/B; two of CS 140, 180, 234, 235, 250; six non-math half-credits.</td>
<td>MATH 130A/B; MATH 134A/B; two of CS 140, 180, 234, 235; six non-math half-credits.</td>
<td>MATH 130A/B; MATH 134A/B; two of CS 140, 180, 234, 235; six non-math half-credits.</td>
</tr>
<tr>
<td><strong>Year Two</strong></td>
<td>MATH 230A/B; MATH 234A/B; STAT 230/231; two math half-credits; two non-math half-credits; two additional half-credits.</td>
<td>MATH 220A/B; MATH 224A/B; STAT 220/221; two non-math half-credits; two additional half-credits.</td>
<td>four math half-credits; three non-math half-credits; three additional half-credits.</td>
</tr>
<tr>
<td><strong>Year Three</strong></td>
<td>six or eight math half-credits (depending on the particular program); two non-math half-credits; two additional half-credits.</td>
<td>six math half-credits; two non-math half-credits; two additional half-credits.</td>
<td>four math half-credits; three non-math half-credits; three additional half-credits.</td>
</tr>
<tr>
<td><strong>Year Four</strong></td>
<td>six or eight math half-credits (depending on the particular program); two non-math half-credits; two additional half-credits.</td>
<td>six math half-credits; two non-math half-credits; two additional half-credits.</td>
<td>not applicable.</td>
</tr>
</tbody>
</table>

**Footnotes to Table II**

1. Table II describes the general framework and required Year One and Two Faculty core courses applicable to all programs in the Faculty of Mathematics. Further degree requirements and recommendations, which depend on a particular program, are described on pages 13:0 - 13:21.

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.

3. On-campus students normally take MATH 130A/B and 134A/B. However, in exceptional circumstances (for example, in the Correspondence program), Pass students may take MATH 113A/B (or 115A/B) and MATH 111A/B respectively in place of the foregoing courses.

4. Some flexibility exists to permit the scheduling of courses in a different manner than that shown in Table II, provided that course prerequisites have been met. In certain cases, substitutions among corresponding Advanced Honours, Honours, and General level courses may be made in the Faculty core. (See Section 4.1 on page 13:24.)
Departmental Honours Programs: Requirements and Recommendations

Except where noted Honours programs may be taken on either the Regular or Co-operative system of study. Academic requirements for corresponding Co-operative and Regular programs are identical.

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 first five examinations 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 specified in Table I on page 13:7, this program requires a total of 44 half-credits, including at least 28 math half-credits. These overall requirements must include the Faculty core courses outlined in Table II on page 13:8 (with CS 140, 180 recommended in Year One) and the following specific courses:

ACTSC 231, 232, 331, 332, 431, 432;
MTHFL 305A;
STAT 333;
four of ACTSC 335 (or C&O 370), AM 381, CS 337, MATH 332B (or PMATH 352), PMATH 331 (or 351A), 334 (or 344), STAT 330, 331;
Two additional 400-level ACTSC half-credits;
Two additional 400-level math half-credits.

MTHFL 305A/B are recommended for Co-op students in Year One and for Regular students in Year One or Two.

Honours students in another department in the Faculty of Mathematics wishing a “Double Major” or a “Minor” in Actuarial Science should consult the section “Combined Honours Programs within the Faculty of Mathematics” which begins on page 13:16.

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 leading mathematical physicists of their time.

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 between Mathematics and Theoretical Physics, 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. As scientists find out more and more about the mechanisms that make the world ‘tick’, we also find that more mathematics is necessary to systematize, digest, and take advantage of this wealth of knowledge in all scientific areas.

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.


For those students who wish a strong emphasis on Physics, the Department offers the program "Honours Applied Mathematics with Physics Electives."

Honours Applied Mathematics

In conjunction with the common degree requirements specified in Table I on page 13:7, this program requires a total of 48 half-credits, including at least 30 math half-credits. These overall requirements must include the Faculty core courses outlined in Table II on page 13:8 (with CS 140 required in Year One) and the following specific courses:
AM 270;
MATH 332B (or PMATH 352);
One of CS 337, PMATH 331 (or 351A);
Two additional 400-level AM half-credits;
Six additional 300 or 400-level AM half-credits.
AM 260 is strongly recommended.
PMATH 334 (or 344) is recommended.
PHYS 121, 122 are recommended in Year One.

Recommended elective courses for Honours Applied Mathematics with Physics Electives are:

Joint Honours Applied Mathematics with Computer Science
In conjunction with the common degree requirements specified in Table I on page 13:7, this program requires a total of 48 half-credits, including at least 30 math half-credits. These overall requirements must include the Faculty core courses outlined in Table II on page 13:9 (with CS 140 required in Year One) and the following specific courses:

AM 270, 371, 381, 391;
CS 235 (or 250), 240, 340;
One of CS 372, 374;
C&O 230;
MATH 332B (or PMATH 352);
Two additional 400-level AM half-credits;
Two additional 400-level CS half-credits;
Two additional 300 or 400-level AM half-credits;
Two additional 300 or 400-level CS half-credits;
One additional AM or CS half-credit at the 300 or 400 level.
PHYS 121, 122 are recommended in Year One.
AM 260 is strongly recommended.
PMATH 334 (or 344) is recommended.

Honours Applied Mathematics with Electives in Engineering (Co-operative only)
In conjunction with the common degree requirements specified in Table I on page 13:7, this program requires a total of 46 half-credits, including at least 30 math half-credits. The math half-credits submitted for the degree must include a minimum of two 400-level AM half-credits and at least six further 300 or 400-level AM half-credits. These overall requirements must include the Faculty core courses outlined in Table II on page 13:9 (with CS 140, 235 required in Year One) and the following specific courses:

AM 260/270 (or 270/280), 371, 381, 391, MATH 332B (or PMATH 352);
Four of AM 340, 362, 365, 380A, 380B, CS 334, 337, C&O 350, 370, PMATH 331 (or 351A), 334 (or 344), STAT 333, 371, 433;

Mathematics
Applied Mathematics
Combinatorics and Optimization

Non-math courses required in Year One:
Groups A, B, C require PHYS 121/122.
Groups D, E require PHYS 121, EL E 123 and 126.
Group F requires PHYS 121/122 and 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.

Group A
ME 219, 220;
Four of ME 351, 354,
CIV E 303, 403, 404, 405, 413, 414, 415.

Group B
SY DE 252, 381; SY DE 281 and/or 543;

Group C
ME 219, 250, 351;
Three of ME 353, 354, 452, 456, 459,
469, 557, 563.

Group D
EL E 123, 126;

Group E
EL E 123, 126, 261, 262, 371, 380;
One of EL E 342, 463, 464, 465, 481, 482.

Group F
CH E 100, 101, 021, 023, 025, 026, 030,
035, 036, 041;
Optional Courses: CH E 034, 033, 038,
CHEM 26, 28.

Honours students in another department in the Faculty of Mathematics wishing a "Double Major" or a "Minor" in Applied Mathematics should consult the section "Combination Honours Programs within the Faculty of Mathematics" which begins on page 13:16.

Combinatorics and Optimization

Combinatorics is the mathematics of discretely structured problems. Although its boundaries are not easily defined, Combinatorics includes the theories of graphs, enumeration, designs, and polyhedra. It is a very old subject which in the past was studied principally for its aesthetic appeal. Today's modern technology, with its vital concern for the discrete, has given Combinatorics new challenges and a new seriousness of purpose. In particular, since computers require discrete formulations of problems, Combinatorics has become indispensable to modern 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 the computer age, Optimization experienced a dramatic growth as a mathematical theory, enhancing both Combinatorics and classical analysis. In its applications to the management and engineering sciences, Optimization forms an important part of the discipline 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 specified in Table I on page 13:7, this program requires a total of 44 half-credits, including at least 28 math half-credits. These overall requirements must include the Faculty core courses outlined in Table II on page 13:8 and the following specific courses:

- MATH 3328 (or PMATH 352);
- PMATH 334 (or 344);
- C&O 230, 350;
- One of CS 337, PMATH 331 (or 351A);
- One of C&O 330, 342;
- One of C&O 351, 367;
- Three additional half-credits chosen from C&O 330, 331, 342, 343, 351, 367, 430 through 466;
- Two additional 300 or 400-level math half-credits with a course prefix other than C&O;
- One additional 300 or 400-level math half-credit.

Joint Honours Combinatorics and Optimization with Computer Science
In conjunction with the common degree requirements specified in Table I on page 13:7, this program requires a total of 44 half-credits, including at least 28 math half-credits. A maximum of ten CS half-credits at the 300 or 400 level may be included in the 44 half-credits presented for a degree. These overall requirements must include the Faculty core courses outlined in Table II on page 13:8 (including CS 140 in Year One) and the following specific courses:

- PMATH 334 (or 344);
- C&O 230, 342, 350;
- CS 240, 250, 340;
- One of MATH 3328 (or PMATH 352), PMATH 331 (or 351A);
- Three of C&O 330, 331, 343, 351, 367, 430 through 466;
- One of CS 372, 374, 466;
- One of CS 350, 354, 358, 360;
- Two additional CS half-credits numbered 440 or higher.

Honours students in another department in the Faculty of Mathematics wishing a “Double Major” or a “Minor” in Combinatorics and Optimization should consult the section “Combination Honours Programs within the Faculty of Mathematics” which begins on page 13:16.

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, based upon their academic performance in 12 half-courses from Year One, with particular emphasis on their performance in MATH 130A/B, 134A/B, and CS 140. In 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. Once admitted to a specific Computer Science Major program, students will normally have the flexibility to change from one Computer Science program to another in the same stream (provided there are no resource limitations in the selected Computer Science Major program), or they may apply to transfer to another program in the Faculty of Mathematics.

Notes

1. Application Procedure

Students will apply for the Computer Science Major program of their choice when they preregister for their 2A term. Normally, only students whose all-inclusive math and overall averages from Year One are both at least 65% will be given serious consideration for admission. Because of resource limitations, however, fulfillment of the minimum 65% entrance average requirements will not guarantee students admission to the program of their choice, or indeed to any Computer Science Major program. If there are more applicants who meet the minimum 65% average requirements than there are positions available for Computer Science Major students, selection will be made on a competitive basis, according to criteria described above.

2. Late Admission

The possibility of admission to Computer Science Major programs at a level beyond 2A will not be completely eliminated. However, it is anticipated that such admissions, normally at the 3A level, will be relatively rare, and usually only when unexpectedly high attrition allows for new students in the programs.

3. Required Withdrawal

A student in a Computer Science Major program whose all-inclusive cumulative Overall or Math average at the end of any term is below 65% must ensure that both averages are at least 65% at the end of each subsequent academic term. Failure to re-establish and maintain these averages at a level of 65% 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 specified in Table I on page 13:7, this program requires a total of 44 half-credits, including at least 27 math half-credits. A maximum of ten CS half-credits at the 300 or 400-level may be included in the 44 half-credits presented for a degree. These overall requirements must include the Faculty core courses outlined in Table II on page 13:8 (with CS 140 required in Year One) and the following specific courses:

**Mathematics**

- Computer Science

Honours Computer Science

In conjunction with the common degree requirements specified in Table I on page 13:7, this program requires a total of 44 half-credits, including at least 27 math half-credits. A maximum of ten CS half-credits at the 300 or 400-level may be included in the 44 half-credits presented for a degree. These overall requirements must include the Faculty core courses outlined in Table II on page 13:8 (with CS 140 required in Year One) and the following specific courses:

- CS 240, 250, 340, 354, 358, 360;
- One of CS 372, 374;
- Three additional 400-level CS half-credits numbered 440 or above;
- C&O 230;
- Four of AM 381, 391, C&O 330, 342, 350, MATH 332B (or PMATH 352), PMATH 331 (or 351A), 334 (or 344), 430A (or 432A), STAT 333, 433.

Honours Computer Science with Electrical Engineering Electives (Co-operative only)

This program has the same course requirements as Honours Computer Science, with the following modifications:

- exclude CS 250 and CS 358;
- include at least two of CS 450, 452, 454, 456, 457;
- include EL E 123, 222, 234, 323, 333, 427, 438.

EL E 222 and 323 will be treated as CS half-credits, in place of CS 250 and 358 respectively, for credit counts and average calculations.

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 specified in Table I on page 13:7, this program requires a total of 44 half-credits, including at least 26 math half-credits. A maximum of ten CS half-credits at the 300 or 400-level may be included in the 44 half-credits presented for a degree. These overall requirements must include the Faculty core courses outlined in Table II on page 13:8 (with CS 140, 180 required in Year One) and the following specific courses:

- CS 240, 250, 340, 354, 360, 448, 482;
- Two additional 400-level CS half-credits numbered 440 or above;
- C&O 230;
- Two math half-credits chosen from:
  - C&O 342, 350, 370, STAT 331, 332, 333, 371;
  - ACC 121, 122, BUS 111W, 121W, 352W, 481W, 491W, ECON 101, 102, M SCI 211, 311, 432, MTHEL 100.
- DRAMA 223 is recommended.
Courses labelled BUS are offered by Wilfrid Laurier's School of Business and Economics. They are described by title on pages 13:19.

Joint Honours Computer Science with Mathematics/Business Administration, Chartered Accountancy or Management Accounting Options

In conjunction with the common degree requirements specified in Table I on page 13:7, this program requires a total of 48 half-credits, including at least 26 math half-credits. These overall requirements must include the Faculty core courses outlined in Table II on page 13:8 (with CS 140, 180 required in Year One) and the following specific courses:

- C&O 230;
- CS 240, 250, 340, 354, 360, 448, 482;
- One of CS 372, 374;
- STAT 331;
- Two additional half-credits chosen from:
  - CS 350, 358, 440-498;
  - Two of AM 380A (or PMATH 380A), C&O 342, 350, 367, 370, 454, STAT 332, 333, 335, 443;

All specified non-math courses in the Honours Mathematics/Business Administration, Chartered Accountancy and Management Accounting Options (see page 13:19).

Note that, in addition to the 65% Math and Overall Graduation Average requirements for an Honours BMath degree, students in the Honours Computer Science/Accounting Options must also achieve an average of at least 70% in all of the courses with the prefix ACC that are explicitly required for their program.

Joint Honours Applied Math with Computer Science

This program is described with Applied Mathematics programs on page 13:10.

Joint Honours Combinatorics and Optimization with Computer Science

This program is described with Combinatorics and Optimization programs on page 13:11.

Joint Honours Pure Mathematics with Computer Science

This program is described with Pure Mathematics programs on page 13:14.

Joint Honours Statistics with Computer Science

This program is described with Statistics programs on page 13:16.

Mathematics

Computer Science

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 specified in Table I on page 13:7, this program requires a total of 44 half-credits, including 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 13:8 (with CS 140, 180 required in Year One) and the following specific courses:

Notes

1. Honours students in another department in the Faculty of Mathematics wishing a "Double Major" or a "Minor" in Computer Science should consult the section "Combination Honours Programs within the Faculty of Mathematics" which begins on page 13:16.

2. 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 13:21.
One of AM 381, MATH 332B (or PMATH 352), PMATH 334 (or 344);
C&O 350, 351, 370;
CS 234, 337, 437;
STAT 331, 333, 371, 443;
Four math half-credits chosen from:
C&O 342, 367, 450 through 466, CS 334, 432,
STAT 332, 335, 430, 433;
M SCI 211/311, or PSYCH 101/333, or SOC 101/242;
Two of ACC 121, 122, ECON 101, 102, M SCI 481;
Two of ACC 371, BUS 352W, M SCI 432.
DRAMA 223 is recommended.
(BUS 352W is offered by Wilfrid Laurier’s School of Business and Economics. It is described by title on page 13:19.)
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.

**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 applications to the basic sciences or technology in mind. 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), 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 three programs: Honours Pure Mathematics, Joint Honours Pure Mathematics with Computer Science and Joint Honours Pure Mathematics with Statistics. For all 3 programs, **MATH 244B is strongly recommended**.

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 specified in Table I on page 13:7, this program requires a total of 44 half-credits, including at least 26 math half-credits. These overall requirements must include the Faculty core courses outlined in Table II on page 13:8 and the following specific courses:

- C&O 230;
- PMATH 344, 351A/B, 352, 367;
- One of PMATH 451, 452, 453;
- One of PMATH 441, 445, 446, 447;
- Three additional 400-level PMATH half-credits other than PMATH 430A;
- Two additional 400-level math half-credits.

**Joint Honours Pure Mathematics with Computer Science**

In conjunction with the common degree requirements specified in Table I on page 13:7, this program requires a total of 44 half-credits, including at least 27 math half-credits. These overall requirements must include the Faculty core courses outlined in Table II on page 13:8 (with CS 140 required in Year One) and the following specific courses:

- C&O 230;
- CS 240, 250, 340, 360;
- One of CS 372, 374;
- PMATH 344, 351A, 352;
- Two additional 400-level CS half-credits;
- Three additional 400-level PMATH half-credits other than PMATH 430A;
- One additional 300 or 400-level PMATH or CS half-credit.

**Joint Honours Pure Mathematics with Statistics**

In conjunction with the common degree requirements specified in Table I on page 13:7, this program requires a total of 44 half-credits, including at least 26 math half-credits. These overall requirements must include the Faculty core courses outlined in Table II on page 13:8 and the following specific courses:
PMATH 344, 351A/B, 352, 451;
STAT 330, 331, 332, 333, 430;
One of STAT 433, 450;
Two additional 400-level PMATH half-credits other than PMATH 430A;
One additional PMATH half-credit.

Honours students in another department in the Faculty of Mathematics wishing a "Double Major" or a "Minor" in Pure Mathematics should consult the section "Combination Honours Programs within the Faculty of Mathematics" on page 13:16.

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 intelligenty 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 specified in Table I on page 13:7, this program requires a total of 44 half-credits, including at least 26 math half-credits. A maximum of ten STAT courses at the 300 or 400-level may be included in the 44 half-credits presented for a degree. These overall requirements must include the Faculty core courses outlined in Table II on page 13:8 and the following specific courses:

STAT 330, 331, 332, 333, 430, 450;
Four of ACTSC 431, 432, AM 371, 381, 391,
C&O 330, 350, CS 337, MATH 332B (or PMATH 352), PMATH 331 (or 351A), 334 (or 344), 351B, 452;
One additional 400-level STAT half-credit;
Three additional 300 or 400-level math half-credits.

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
CH E 021, 023, 026, 031, 037, 041;
CHEM 123/124, PHYS 121/122.

Civil (transportation)
CIV E 126, 292†, 340, 342, 343, 344;
PHYS 121/122.

Groups of courses in Fluid Mechanics and Hydrology, and Water Quality Control are also available*.

Management Sciences
M SCI 211, 261†, 311, 432, 452, 461†.

Mechanical
ME 215, 219, 250, 321, 351 and
one of 340, 348;
PHYS 121/122.

Groups of courses in Automation, Production, Materials, Solid Body Mechanics and Thermo fluids are also available*.

Systems Design
SY DE 281, 364, 384, 432, 544, 555;
PHYS 121/122.

*Details are available in the Statistics Undergraduate Studies Handbook.
†Students with credit in ECON 101/102 will be required to substitute other Engineering courses for the indicated courses.
Joint Honours Statistics with Computer Science
In conjunction with the common degree requirements specified in Table I on page 13:7, this program requires a total of 44 half-credits, including at least 28 math half-credits. These overall requirements must include the Faculty core courses outlined in Table II on page 13:8 (with CS 140 required in Year One) and the following specific courses:

- STAT 330, 331, 332, 333, 343;
- CS 240, 250, 340;
- One of CS 372, 374;
- Two of CS 350, 354, 358, 360;
- One of AM 371, 381, 391, C&O 330, 350, MATH 332B (or PMATH 352), PMATH 331 (or 351A), 334 (or 344);
- Two additional 400-level CS half-credits numbered 440 or above;
- One additional 400-level STAT half-credit.

Joint Honours Pure Mathematics with Statistics
This program is described with Pure Mathematics programs on page 13:14.

Honours students in another department in the Faculty of Mathematics wishing a "Double Major" or a "Minor" in Statistics should consult the section "Combination Honours Programs within the Faculty of Mathematics" which begins below.

Combination Honours Programs within the Faculty of Mathematics

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, Math/Teaching Option, 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).

Honours 'X' with 'Y' Minor Programs
All Honours requirements for area 'X' and the specific requirements designated below for area 'Y' must be satisfied. 'X' refers to any one of Actuarial Science, Applied Mathematics, Combinatorics and Optimization, Computer Science, Math/Teaching Option, Operations Research, Pure Mathematics, and Statistics.

'Y' Minor Requirements

Actuarial Science:
ACTSC 231, 232, 331, 332, MTHEL 305A;
One of ACTSC 431, 432;
One additional ACTSC half-credit.

Mathematics
Combination Honours Programs

Applied Mathematics:
AM 270, 340, 371, 381, 391;
Two additional 300 or 400-level AM half-credits.

Combinatorics & Optimization:
C&O 230, 350;
One of C&O 330, 342;
Two additional half-credits chosen from C&O 330, 331, 342, 345, 351, 367, 430 through 466.

Computer Science:
CS 140, 234, 236;
Five additional CS half-credits.

Pure Mathematics:
PMATH 344, 351A, 352;
One of PMATH 351B, 360, 367, 452;
Two additional 300 or 400-level PMATH half-credits.

Statistics:
STAT 331, 332, 333;
Two additional 300 or 400-level STAT half-credits.

Combination Honours Programs with other Faculties leading to the BMath Degree

In the descriptions below, 'X' refers to any one of Honours Mathematics Non-Specialist, Actuarial Science, Applied Mathematics, Combinatorics and Optimization, Computer Science, Math/Teaching Option, Operations Research, Pure Mathematics, Statistics. 'Z' refers to a discipline in a faculty other than Mathematics.

Joint Honours Programs 'X' and 'Z'
All Honours requirements for area 'X' and the set of requirements for area 'Z' designated below must be satisfied. Note that the number of 'math half-credits' required may be reduced as low as 24, provided that such a reduction does not make it impossible to satisfy all Honours requirements of area 'X'. 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 area 'Z'.

Anthropology
At least 14 term courses in Anthropology. ANTH courses must include:
a) 101, 201, 202, 260, 300, 330;
b) 102A or 102B;
c) 103 or 283 or 290;
d) one 400-level term course;
e) 499A/B (Anthropology Honours Essay)
Economics 101, 102, 201, 202, 231, 301, 302, 311, 321, 401, 402, 421, 422; one additional Economics term course.

English 16 English Major term courses as outlined under "Joint Honours Programs" on page 8:20.

French 16 term courses in French as outlined under "French Joint Honours Program" on page 8:23.

Geography A minimum of 14 term courses (or equivalent) in Geography (up to four term courses designated Environmental Studies may be counted for credit as Geography courses). Required courses are: GEOG 101, 102, 160, 201, 202, one of 208 or 309, 275, 381; ENV S 200; one of GEOG 203, 204, 205, 220, 221; one of GEOG 125R, 126R, 127, ENV S 195A or 195B.

German A minimum of 16 approved term courses in German, which must include GER 291/292. Please consult the Department for program details.

Music At least 16 term courses in Music, including: MUSIC 100; at least three of MUSIC 253, 254, 353, 354; at least three of MUSIC 250, 251, 370, 371; nine additional Music term courses of which at least six must be above the 100 level; an Honours seminar in Music. As well, participation in at least six terms of Music Ensemble is required.

In addition, students must demonstrate competence on one instrument (or voice) equal to Grade ten standing at the Royal Conservatory of Music in Toronto. Normally this is attained through taking Music Studio courses - MUSIC 266/267, 366/367.

Philosophy 221, 258, 322, 359, 380, 381, 384, 385, 440A/B; four additional term courses in Philosophy.

Psychology Students must complete the equivalent of 14 term courses in Psychology, and an Honours thesis (PSYCH 499A/B). The required course selection is detailed under "Joint Honours Programs" on page 8:33.

Mathematics Combination Honours Programs
Faculty General, Honours and Pass Programs

Russian A minimum of 16 approved term courses in Russian. Please consult the Department for program details.

Sociology 101, 321, 322, 405, 406, 499A/B (Sociology Honours Essay); eight additional SOC term courses (or the equivalent).

Honours 'X' with 'Z' Minor
All Honours requirements for area 'X' ('X' as defined earlier in this section) and a set of ten half-credits prescribed by discipline 'Z' (where 'Z' can be any departmental area, not necessarily restricted to the disciplines mentioned above) in a faculty other than Mathematics which chooses to make a 'Minor' designation available to Math Faculty students, must be satisfied. The minimum average required in these ten half-credits is determined by area 'Z'.

BMath Transcripts
BMath transcripts include explicit mention of no more than two areas of study in the academic program section.

Note
Combination Honours Programs leading to a degree in another faculty (i.e. not BMath) are described on page 13:21.

Non-Departmental Honours, General and Pass Programs: Requirements and Recommendations

Except where noted, Honours Programs may be taken on either the Regular or Co-operative system of study. Academic requirements for corresponding Co-operative and Regular programs are identical. Pass and General Programs are available only in the Regular system.

Faculty Honours, General and Pass Programs:

Honours Mathematics: Non-Specialist 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 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 either for careers in the applications of mathematics or for graduate studies. By choosing appropriate courses, a
student should be eligible to proceed from this program to graduate work in any area of mathematics.

In conjunction with the common degree requirements specified in Table I on page 13:7, this program requires a total of 48 half-credits, including at least 30 math half-credits. These overall requirements must include the Faculty core courses outlined in Table II on page 13:8 (with CS 140 required in Year One) and the following specific courses:

AM 260*, 270*, 340*;
C&O 230, 270*, 350*;
CS 234*, 235*, 334*;
MATH 332B (or PMATH 352);
PMATH 331 (or 351A);
STAT 331*;
One of AM 444, C&O 330, PMATH 334 (or 344), STAT 430;
Two additional 300 or 400-level math half-credits;
Four additional 400-level math half-credits with 300-level prerequisites (see Note 2 below).

Notes
1. In individual cases, the sequences indicated by (*) may be replaced by alternative sequences in the same subject area (at the same or higher level) at the discretion of the department concerned.
2. Students in the Non-Specialist Faculty 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. Two of the 400-level math half-credits may be replaced by 400-level half-credits in the non-math Minor or second Major area.

General Mathematics (Regular Only)
Students enrolled in the General Math/Business Administration Option are not covered by the degree requirements described in this section. Requirements and recommendations for this Option follow this section.

The degree requirements outlined below apply only to students who entered Year Three in the Faculty of Mathematics in September, 1984 or later. Students who entered Year Three prior to this time should consult the Mathematics Undergraduate Office to determine the degree requirements that apply to them.

In conjunction with the common degree requirements specified in Table I on page 13:7, this program requires a total of 42 half-credits, including at least 24 math half-credits. These overall requirements must include the Faculty core courses outlined in Table II on page 13:8 and the following specific courses:

MATH 322A/B, 324;
One of ACTSC 335, CS 337, 372, 375, C&O 350, AM 444;
Eight additional math half-credits which may not include more than two half-credits with the same course prefix (ACTSC, AM, C&O, MATH, PMATH, STAT). [See Note 1 below.]

Notes
1. Students are advised to select these eight additional math half-credits from the recommended lists below. (The courses listed are only recommendations from the Faculty. Other math courses may be chosen to satisfy the "course-breadth" requirement, provided they are at the 200-level or above.)

ACTSC 221, 222, 337;
AM 260, 270, 340, 380A/B, 444;
C&O 220, 270, 350, 370, 380, 382;
CS 234, 235, 330, 334, 335, 337, 430, 432, 435, 437, 438;
PMATH 230A, 340, 380, 380A/B, 430A/B;
STAT 321, 322.
2. There are no restrictions as to course prefix for any math courses taken beyond the 24 explicitly required math half-credits.

Pass Mathematics (Regular only)
In conjunction with the common degree requirements specified in Table I on page 13:7, this program requires a total of 32 half-credits, including at least 12 math half-credits. These overall requirements must include the Faculty core courses outlined in Table II on page 13:8.

Mathematics/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 Accounting Group 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 in both the Regular and Co-operative systems of study. The Business Administration Option is available at the General level, but only 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 all 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 16 CMA exemptions and also to write four of the Society’s six Uniform National Examinations required for CMA (Certified Management Accountant) certification.

Co-operative work terms are accepted by both the Institute and the Society as part of their respective internship requirements. Thus, Co-op graduates are normally able to complete all Institute or Society requirements in as little as one year after graduation. Graduates of the Regular program are frequently able to complete all such requirements in as little as two years after graduation.

**Note**

In the requirements and recommendations which follow, courses with prefix BUS are offered by Wilfrid Laurier’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

The WLU Academic Calendar should be consulted for complete course descriptions.

Honours Mathematics/Business Administration, Chartered Accountancy, Management Accounting Options

In conjunction with the common degree requirements specified in Table I on page 13:7, these programs require a total of 44 half-credits, including at least 22 math half-credits. These overall requirements must include the Faculty core courses outlined in Table II on page 13:8 (with CS 140, 180 required in Year One) and one of the course packages listed below.

On entering Year Three, students must specify one of the following packages a), b), c):

a) **Information Systems Package**
   - CS 234, 330, 438, STAT 331;
   - CS 432 or 434;
   - Two of AM 380A (or PMATH 380A),
     C&O 350, 367, 370, 454;
   - One of STAT 332, 333, 335, 443;
   - One additional 300 or 400-level CS half-credit;
   - One additional 300 or 400-level math half-credit.

b) **Optimization Package**
   - C&O 350, 351, 370, CS 330, 438, STAT 331;
   - Two of C&O 367, 450, 452, 454, 456, 459, 464, 466;
   - One of STAT 332, 333, 335, 443;
   - One additional 300 or 400-level math half-credit.

c) **Statistics Package**
   - STAT 331, 332, 335, 443, CS 330, 438;
   - One of C&O 350, 367, 370, 454;
   - One of STAT 333, 430, 440;
   - One additional 300 or 400-level math half-credit.

ACTSC 221 (or 231), C&O 270, and DRAMA 223 are recommended for all three packages.

The non-math half-credits required (together with the terms in which these courses are normally taken) are given in the table below.

<table>
<thead>
<tr>
<th>Math/Bus. Admin.</th>
<th>Math/Accounting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Term</td>
<td>Option</td>
</tr>
<tr>
<td>1A</td>
<td>ACC 121, BUS 111W, ECON 101</td>
</tr>
<tr>
<td>1B</td>
<td>ACC 122, BUS 121W</td>
</tr>
<tr>
<td>2A</td>
<td>BUS 352W, MTHEL 100</td>
</tr>
<tr>
<td>2B</td>
<td>BUS 362W</td>
</tr>
<tr>
<td>3A</td>
<td>ACC 371, M SCI 211</td>
</tr>
<tr>
<td>3B</td>
<td>ACC 372, M SCI 311</td>
</tr>
<tr>
<td>4A</td>
<td>BUS 454W, 481W</td>
</tr>
<tr>
<td>4B</td>
<td>BUS 491W, M SCI 432</td>
</tr>
</tbody>
</table>

**Notes**

1. ACC 401, 453 are strongly recommended in terms 4A/B of the Accounting Options.

2. In addition to the 65% Math and Overall Graduation Average requirements for an Honours BMath degree, students in the Honours Math/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.

3. The explicitly required non-math half-credits for the Math/Chartered Accountancy and Management Accounting Options are identical except for M SCI 211 which is required only in the Management Accounting Option.

4. The minimum grade required to satisfy a prerequisite for courses with prefix ACC is C-.

Joint Honours Computer Science with Mathematics/Business Administration, Chartered Accountancy or Management Accounting Options

These programs are described with Computer Science programs on page 13:13.

General Mathematics/Business Administration Option (Regular only)

In conjunction with the common degree requirements specified in Table I on page 13:7, this program requires a total of 42 half-credits, including at least 24 math half-credits. These overall requirements must include the Faculty core courses outlined in Table II on page 13:8 (with CS 140, 180 required in Year One) and the following specific courses:

ACTSC 221;
Two of CS 235, 330, 438;
Two of C&O 270, 350, 367, 370;
One of STAT 321 (See Note below), 322.

The non-math half-credits required are the same as for Honours students, except that ACC 372 is not required for General students. These courses are stated (together with the terms in which they are normally taken) in the corresponding table for Honours students.

Note

STAT 321 is required by the Society of Management Accountants, but not for the BMath degree.

Mathematics/Teaching Option

Students interested in the program should enrol in any one 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 5:3.) 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 specified in Table I on page 13:7, this program requires a total of 44 half-credits, including at least 26 math half-credits. The math half-credits submitted for the degree must include at least twelve 300 or 400-level math half-credits, and students are encouraged to gain as much mathematical breadth as possible in their selection. These overall requirements must include the Faculty core courses outlined in Table II on page 13:8 and the following specific courses:

C&O 230;
MATH 332B (or PMATH 352);
PMATH 331 (or PMATH 351A);
PMATH 334 (or PMATH 344);
One of AM 270, 280, 340;
One of C&O 270, 380, 480, 481;
One of CS 330, 334, 335, 337;
One of PMATH 340, 360, 430A;
One of ACTSC 221, STAT 331, 332, 333;
MTHEL 206A, SOC 207G.

Recommended non-math courses include:

PSYCH 212, 213, PHIL 311, 312, and MTHEL 102.

Notes

1. Successful completion of the academic requirements of any other departmental Honours program in the Faculty of Mathematics will be accepted as a replacement for the requirements listed above. (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 in London. This term occurs after all other components of the program have been completed.
3. The selection of courses required to satisfy the BMath Teaching Option must include at least four half-credits in one of the following subject disciplines:
   - Biology
   - Chemistry
   - Computer Science
   - Environmental Studies
   - General Science
   - Physical Education
   or Physics. These four half-credits will fulfill the Ministry of Education's requirement for a second teaching subject.

4. It is recommended that students choosing Computer Science as the second teaching subject select CS 140, 180, 234, 235. Additional courses of value are CS 432 and 437.

Combination Honours Programs Leading to a Degree with Another Faculty

Joint Honours Programs
Joint Honours programs exist between the Faculty of Mathematics and any one of the following departments: Economics, French, Geography, German, Environment and Resource Studies, Philosophy, Psychology, Russian, Sociology.

The Faculty of Mathematics course requirements for each of these Joint Honours programs are the same, consisting of a total of 14 math half-credits with a minimum average of 65%. These overall requirements must include the following specific courses:
- MATH 130A/B, 134A/B, 230A/B, 234A/B;
- STAT 230, 231;
- Two of CS 100, 102, 234, 235;
- Two additional math half-credits which qualify for BMath degree credit.

Students wishing to specialize in one area of mathematics should consult the Undergraduate Officer of the appropriate department in the Faculty of Mathematics for advice in selecting their 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 65%. These overall requirements must include the following specific courses:
- MATH 130A/B, 134A/B;
- STAT 220, 221;
- Two of CS 100, 102, 234, 235;
- Two additional math half-credits which qualify for BMath degree credit.

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 65%, which must consist of:
- a half-credit Calculus course;
- a half-credit Algebra course;
- CS 102 or equivalent;
- CS 234, 235;

Division of Mathematics for Industry and Commerce

The Division is a unit within the Faculty of Mathematics which deals with those activities that relate closely to business and industry. The Division manages five programs related to industry and commerce within the Faculty of Mathematics:
1) Operations Research
2) Computer Science/Information Systems
3) Mathematics/Management Accounting
4) Mathematics/Chartered Accountancy
5) Mathematics/Business Administration

In addition, the Division serves as a focal point for contact between faculty members and the industrial and commercial sector.

Members of the Division are drawn from existing departments within the Faculty of Mathematics, as well as other groups on campus which are involved with these programs, specifically the Accounting Group, Department of Co-operative Education and Career Services, and Department of Management Sciences (Engineering). There is also external representation from the accounting profession and various other areas of business and commerce.

Centre for Information Theory

The Centre for Information Theory was created by the Senate of the University of Waterloo on September 15, 1980. It consists of members of the Engineering, Mathematics, and Science Faculties who are teaching and doing research in Information Theory.

Members of the Centre work on the algebraic, combinatorial, non-probabilistic, probabilistic and mixed theories of information and their applications to coding, cryptography, economics, engineering,
forecasting, optimization, physics, pattern recognition, picture processing, and system designs. The Centre organizes a Seminar and Lecture Series on Information Theory and publishes Research Reports. There are several graduate and undergraduate courses on Information Theory and Coding taught by members of the Centre in the areas mentioned above. The specific courses are listed in the Calendar under the appropriate departments.

Recognition of Academic Excellence

1. **DEAN'S HONOURS LIST**

To recognize outstanding academic achievement each term, the designation "Dean's Honours List" will be awarded to undergraduate Mathematics 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 at least a standard course load in the term will be eligible for the Dean's Honours List. (See Table I on page 137 for definition of 'standard' course load.) This designation will be reflected on end-of-term grade reports and official university transcripts.

Those with outstanding academic records throughout their undergraduate careers who qualify for a BMath Honours degree will "Graduate on the Dean's Honours List" if their cumulative averages (both math and overall) are at least 85%, based on all courses taken. In addition to an appropriate notation on their official university transcript, those who "Graduate on the Dean's Honours List" will have their names displayed in gold in the Math Faculty Colloquium Room (MC 5158).

2. **ALUMNI GOLD MEDALLIST**

An Alumni Gold Medal is presented annually (usually at the Spring Convocation) to recognize the academic excellence of the Faculty's most outstanding undergraduate student.

3. **K.D. FRYER GOLD MEDAL**

The K.D. Fryer Gold Medal is presented annually at Fall Convocation to a graduating student who best exemplifies academic excellence and good student citizenship.

**Faculty Policies**

1. **UNDERGRADUATE STANDINGS AND PROMOTIONS COMMITTEE**

Membership, Duties, Operating Procedures

The Committee consists of the Dean, Associate Dean for Undergraduate Studies, Assistant Dean (External Programs), the Assistant Registrar, Faculty of Mathematics (who serves as the Committee's Secretary), the Academic Advisors for each of the Faculty's undergraduate programs, a representative of St. Jerome's College, the Director of Undergraduate Affairs, 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 appeals 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. All such requests must be made in writing to the Assistant Registrar, Faculty of Mathematics, Needles Hall. At its meetings the Committee carefully deliberates all petitions and requests, 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. **PROMOTIONAL 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 on 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 fall into one or more of the following categories:

i) They have accumulated more than six half-credit failures in total.
ii) They have accumulated four 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) At the end of their first two full-time terms of registration (or by the time they have accumulated 12 half-course attempts, whichever comes first), they have failed to complete successfully eight half-credits, with an average on these eight half-credits of at least 60%.

Students who have been required to withdraw as Honours BMath degree candidates will be permitted to register in a BMath Pass or 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 Pass or General will not normally be permitted to take Honours-level mathematics courses when there are corresponding General-level courses available (e.g. MATH 220A rather than MATH 230A).

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 failed to satisfy all requirements for a BMath Pass degree by the end of the first term in which they have accumulated 44 or more half-course attempts.

iv) 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 from the Faculty of Mathematics will not normally be re-admitted to a degree program in Mathematics at any point in the future. However, at the time a Required-To-Withdraw decision is given, the Standings and Promotions Committee will review the student's academic record to date. If, at the end of any term prior to the term when withdrawal is being required, the student would have qualified for a lesser BMath degree, the student will be granted that lesser degree, even though he/she is not being permitted to pursue his/her studies in the Faculty of Mathematics toward a higher degree.

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), 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 Grade Appeals
Any math student wishing to appeal a grade may do so by contacting the Assistant Registrar, Faculty of Mathematics, in Needles Hall, and requesting a grade appeal form. The grade appeal form must be completed and returned to the Registrar's Office along with $5.00 per grade appeal (which is refunded if the grade is raised). Such an appeal must be submitted normally within one month of the official release of that term's grades. Please note, however, that a grade may be lowered if a re-examination leads to the discovery of an earlier error not in the student's favour.
4. POLICIES RE: COURSES

4.1 Corresponding Advanced/Honours/General Level Courses
All new on-campus admissions to the Faculty of Mathematics take first-year Calculus and Algebra at the Honours level (MATH 130A/B, MATH 134A/B), or at the Advanced Honours level (MATH 140A/B, MATH 144A/B). The Advanced Honours level courses are intended for exceptionally gifted students in an Honours program. A student pursuing an Honours degree may substitute the corresponding Advanced Honours level course(s) for any required Honours level course(s).

After completing first year of an Honours program, a student pursuing a Pass or General degree may substitute the corresponding Honours level course(s) for any required General level course(s), unless the student has been required by the Standings and Promotions Committee to transfer from an Honours program to General or Pass. In this case, the student must subsequently enrol in General level courses.

4.2 Course Upgrading
A student who takes the General version of a course instead of the Honours version (e.g. MATH 220A instead of 230A), but later decides to pursue an Honours degree, may petition the Standings and Promotions Committee for special consideration. In the past, in a few rare instances where the academic record of the student in question was of very high calibre, the Committee has permitted the student to count the General course toward an Honours degree. In other cases, the Committee may permit the student to write a special final examination in the Honours course without submitting all the written work normally required during the term. In such cases, the grade obtained will be treated in the same manner as if the student had registered in the Honours course and obtained that final mark. Otherwise, the student must formally retake the course at the Honours level.

4.3 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 4 with Table I on page 13:7). Note that supplemental examinations are not available for students in the Faculty of Mathematics.

4.4 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 4 with Table I on page 13:7).

4.5 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 by the Mathematics Undergraduate Office. It is the student’s responsibility to be aware of the contents of these lists.

4.6 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. However, any additional courses (math or non-math) may be taken on a part-time basis by Correspondence for Honours degree credit.

For BMath General and Pass degrees, 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 and off-campus 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 completely separate application forms available in the Correspondence Program Office.

4.7 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 4 with Table I on page 13:7). 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.

4.8 Dropping/Adding Courses

Normally, the last day to ADD a course is two weeks after the official beginning of lectures. 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. A 'standard' course load is defined in Table I on page 13:7. 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 5.6. on page 13:27.

Since OSAP assistance is partially based on the course load in which a student is enrolled, course drop/adds during the term can affect a student's initial entitlement. 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 before the drop deadline in the term in which the course is taken. A course attempt not successfully completed constitutes a course failure.

5. MISCELLANEOUS POLICIES

5.1 Special Co-op Regulations

1) 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 all students in the Math/Teaching Option, Math/Chartered Accountancy, and Computer Science/Chartered Accountancy 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 Regular BMath General (or Pass) 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 (or General) degree. However, if they wish to obtain a Co-op degree, they will normally 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 be eligible only for a Regular 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 expected to maintain a full-time course load of three or more half-credits, unless they are within one or two half-credits of fulfilling the academic degree requirements for their program. 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.

5.2 Course Load
Students may not normally preregister for more than the standard course load associated with their program. (See Table I on page 13:7.) 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. Pass and General students may not normally add courses beyond their standard course load.

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 at the end of the two-week course-change period may not normally drop any courses subsequent to that date.

The number of half-credits constituting a standard course load varies according to a student's program and year of registration. (See Table I on page 13:7.) In all cases, a student's "year" will be determined by the number of half-credits (N) achieved to date:

First Year: $0 \leq N < 10$
Second Year: $10 \leq N < 20$
Third Year: $20 \leq N < 32$
Fourth Year: $32 \leq N$

5.3 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 such courses 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.

5.4 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.

5.5 Illness or Incapacity
Normally, failure to write a required final examination 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 so inform their instructors and 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, 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 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 university record.

5.6 Voluntary Withdrawal
The normal deadline date for Math undergraduate students to withdraw from the Faculty of Mathematics 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 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.)

5.7 ‘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, he/she will normally be subject to Faculty policies in effect at the time of re-admission.
(‘Inactive’ is taken to mean that the student has not been registered at the University of Waterloo, or on an approved Letter of Permission as a BMath degree candidate.)

6. BMATH WRITING SKILLS REQUIREMENT

BMath degree candidates with an initial registration in the Faculty of Mathematics of Fall/82 or later must satisfy the following Writing Skills Requirement:

“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 both the Student Examination Report and the student’s transcript with a CR grade once the student has successfully completed the Writing Skills Requirement.

BMath degree candidates with an initial registration in the Faculty of Mathematics of Fall/80 or later, but still prior to Fall/82, must also satisfy this same writing skills requirement, except that Co-op students in this category have the option of substituting four successful Co-op work reports to fulfill the requirement.

BMath degree candidates with an initial registration in the Faculty of Mathematics prior to Fall/80 are not required to satisfy a BMath Writing Skills Requirement.

7. "AREAS OF STUDY" ON TRANSCRIPTS

BMath transcripts include explicit mention of no more than two areas of study in the academic program section.
Faculty of Science
Faculty of Science

The first students were enrolled in the Faculty of Science in the Fall of 1959. There are now approximately 2100 undergraduate full-time students and approximately 260 graduate students taking programs within the faculty.

The Faculty of Science consists of four departments: Biology, Chemistry, Earth Sciences and Physics, and the School of Optometry.

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 an Honours Science and Business Program and an Honours BSc in Psychology in co-ordination with the Department of Psychology. A Liberal Science (Science for the Generalist) program is also offered.

Graduate programs leading to the degrees of MSc and PhD are discussed in the University of Waterloo Graduate Studies calendar.

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.

Admission

The admission categories, requirements and procedures for all programs are outlined in Chapter 2 of this Calendar.

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.

Co-operative Students
Students applying to transfer to Co-operative programs in the Faculty of Science will not normally be admitted above the Year 2 Term B level.

Admission as a Mature Student
Applicants are normally required to obtain standing in Grade 13 Calculus and one Grade 13 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 Requirements
All Faculty of Science students entering degree programs in September, 1982 or later must write the English Language Proficiency Examination (scheduled during registration week).

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.
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.

1. Final Examinations
   a) 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 students by the Registrar. Appeals against faculty decisions made under these regulations should be made in writing to the Registrar's Office within one month of the official announcement of marks.
   b) Final examinations are held in December, April, or August. The time normally allowed for each examination is three hours.
   c) 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.
   d) 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.
   e) In cases where a course (failed or passed) is repeated, both marks will be used in calculating the student's cumulative overall average. 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.
   f) No course or its equivalent may be repeated more than once.
   g) All examinations which receive a failing grade are automatically re-read.
   h) 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 must have the permission of the Examinations and Standings Committee.

2. 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:
   a) Evaluation in Year One will be made at the end of term 1B on the entire year's work. Those not meeting requirements of their program will be transferred to the General program (Regular system) in good standing, if possible. Such students may also apply for admission to the Liberal Science program.
   b) 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.
   c) 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.

3. Standing

Grades
Marks in individual courses will be reported as numerical marks on the scale 0.0 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 recorded on the marks report and permanent transcript but for averaging purposes a grade of 32 will be used, equivalent to the weighting factor for the F- on the common system.
Grade Appeals
Any student wishing to appeal a course grade should submit a formal written appeal either through the Registrar’s Office or the Science Undergraduate Affairs Office. Appeal forms are available in both locations.

Normally a formal appeal must be submitted within one month of the official release of the term’s grades.

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.
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 felt 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 acceptable.

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.

AEG or CR will count as a course passed towards the total necessary but will not count in the overall average.

Unless there are medical or other extenuating circumstances, a DNW will be weighted for averaging purposes as a mark of 32 (equivalent to F- on the common grading system) in determining standing.

“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.
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
Credits 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 in Year One or Year Two, Three or Four 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 from the Dean.

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.
Program and Course Selection

Students entering first year in the Faculty of Science are enrolled in a common year. Students in Year One Co-operative Biology, Biochemistry, Chemistry, Earth Sciences and Physics are labelled as such but all other students are officially in Year One Regular Science. Essentially the same courses are available to all first year students and students may enter Year Two programs in Science provided they have taken the necessary courses in Year One, have achieved the necessary passing average, and enrolment restrictions allow it.

1. 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 Grade 13 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.

2. Course and Program Changes
a) 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.
b) 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.
c) 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.
d) 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.

3. Eligibility for Courses
Students must ensure they have the appropriate course prerequisites and where applicable corequisites stated in the course descriptions in the calendar.

4. Overlap courses
Where substantial overlap exists between two courses credit will be granted for only one.

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).

5. 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.

6. 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 and have it authorized by the Associate Dean or an appropriate Undergraduate Officer.

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.

7. Audit
The Faculty of Science does not record nor recognize audits for students in Science or any other Faculty.

8. Enrolment in a Graduate Course
A student may obtain credit toward a graduate degree in the Faculty of Science for normally not more than a one term graduate course taken during the fourth year of an undergraduate program provided this course is not used for credit toward his 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.

9. Reduced Program
Only in exceptional circumstances may an Honours program be taken on a completely part-time or reduced program basis; at least two of the upper three years must be taken on a full-time (full program) basis, one of which must be Year Four, and no student may spend more than five years of full-time study (or its equivalent) for an Honours degree.

A student in good standing who "stops out" of an Honours 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.

Science
Program and Course Selection

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.
## Science Program and Course Selection

### Year One Science Program Selections Leading to Year Two Honours Programs and Optometry

#### 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><strong>Biology</strong> (see Note 3)</td>
<td>Two 200-level term courses in BIOL, CHEM 123/124 and 123L/124L, CS 102.</td>
<td>PHYS 111/112, or MATH 113A/B, EARTH 121/122.</td>
</tr>
<tr>
<td><strong>Biochemistry</strong> (see Note 3)</td>
<td>Two 200-level term courses in BIOL, MATH 113A/B, CHEM 125/126 and 123L/124L, a first year Physics credit with labs, CS 102.</td>
<td></td>
</tr>
<tr>
<td><strong>Biology and Environment and Resource Studies</strong> (see Note 3)</td>
<td>Two 200-level term courses in BIOL, two term courses in ERS, CHEM 123/124 and 123L/124L, CS 102.</td>
<td></td>
</tr>
<tr>
<td><strong>Biology and Geography</strong> (see Note 3)</td>
<td>Two 200-level term courses in BIOL, two term courses in GEOG, CHEM 123/124 and 123L/124L, CS 102.</td>
<td></td>
</tr>
<tr>
<td><strong>Chemistry</strong> (see Note 3)</td>
<td>CHEM 125/126 and 123L/124L, MATH 113A/B, PHYS 121/122 and 121L/122L, CS 102.</td>
<td></td>
</tr>
<tr>
<td><strong>Chemistry and Environment and Resource Studies</strong> (see Note 3)</td>
<td>CHEM 125/126 and 123L/124L, ERS 100, 101, 150, 151; BIOL - two 200-level courses; MATH 113A/B; CS 102; ENV S 195.</td>
<td></td>
</tr>
<tr>
<td><strong>Chemistry with Options</strong> a) Chemistry (Environmental Studies Option) (see Note 3)</td>
<td>CHEM 125/126 and 123L/124L, MATH 113A/B, PHYS 121/122 and 121L/122L, CS 102.</td>
<td>BIOL 111/112, or two 200-level term courses in Biology, EARTH 121/122, ENV S 195.</td>
</tr>
<tr>
<td>b) Chemistry (Mathematics Option) (see Note 3)</td>
<td>CHEM 125/126 and 123L/124L, MATH 115A/B, PHYS 121/122, and 121L/122L, MATH 114, CS 102.</td>
<td></td>
</tr>
<tr>
<td>c) Chemistry (Physics Option) (see Note 3)</td>
<td>CHEM 125/126 and 123L/124L, MATH 115A/B, PHYS 121/122, and 121L/122L, CS 102, MATH 111A/134B.</td>
<td></td>
</tr>
<tr>
<td><strong>Earth Sciences</strong> (see Note 3)</td>
<td>EARTH 121/122, CHEM 123/124 and 123L/124L, PHYS 121/122 and 121L/122L, CS 102, MATH 113A/B, one unrestricted term course.</td>
<td></td>
</tr>
<tr>
<td><strong>Earth Sciences (Geography Option)</strong> (see Note 3)</td>
<td>EARTH 121/122, CHEM 123/124 and 123L/124L, GECG 101/102, CS 102. Either PHYS 111/112 and 111L/112L or BIOL 111/112 or equivalent elective.</td>
<td></td>
</tr>
</tbody>
</table>
### Year One Science Program Selections Leading to Year Two Honours Programs and Optometry

#### 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><strong>Optometry</strong> (consult page 14:31 for full list of prerequisites for admission to Optometry)</td>
<td>MATH 113A/B, BIOL 230 and 211, CHEM 123/124 and 123L/124L, PHYS 121/122 and 121L/122L, PSYCH 101.</td>
<td>PSYCH 102(A-G) or SOC 101.</td>
</tr>
<tr>
<td><strong>Physics</strong> (see Note 1)</td>
<td>MATH 115A/B or MATH 113A/B; MATH 134A/B or MATH 111A/B; PHYS 121/122; PHYS 121L/122L; PHYS 123.</td>
<td>CHEM 123/124 and 123L/124L.</td>
</tr>
<tr>
<td><strong>Psychology</strong></td>
<td>Two 200-level term courses in BIOL, CHEM 123/124 and 123L/124L, PHYS 111/112, 111L/112L or 121/122 and 121L/122L, MATH 113A/B, PSYCH 101; one PSYCH elective.</td>
<td></td>
</tr>
<tr>
<td><strong>Honours Science and Business</strong> (see Notes 3 and 4)</td>
<td>2.0 Science lecture-credits from the Year One offerings in CHEM, EARTH, and PHYS; BIOL 230 and 233; MATH 113A/B; BUS’111W; BUS 121W, CS 102; MATH 111B.</td>
<td></td>
</tr>
<tr>
<td><strong>General Science &amp; Honours Science non-major</strong> (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>

#### 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><strong>Applied Chemistry</strong> (see Notes 2 and 3)</td>
<td>CHEM 125/126 and 123L/124L, MATH 115A/B, PHYS 121/122 and 121L/122L, CS 102.</td>
<td></td>
</tr>
<tr>
<td><strong>Applied Physics</strong> (see Notes 1 and 2)</td>
<td>MATH 115A/B, MATH 134A/B, PHYS 121/122, PHYS 121L/122L; PHYS 123.</td>
<td>CHEM 123/124 and 123L/124L.</td>
</tr>
<tr>
<td><strong>Applied Physics</strong> (Geophysics Option) (see Notes 1, 2 and 3)</td>
<td>MATH 114, 115A/B, PHYS 121/122 and 121L/122L, CHEM 123/124 and 123L/124L, CS 102, EARTH 121/122.</td>
<td></td>
</tr>
<tr>
<td><strong>Applied Earth Sciences</strong> (Geology Option) (see Note 3)</td>
<td>EARTH 121/122, CHEM 123/124 and 123L/124L, PHYS 121/122 and 121L/122L, CS 102, MATH 113A/B.</td>
<td></td>
</tr>
<tr>
<td><strong>Applied Earth Sciences</strong> (Geophysics Option) (see Note 3)</td>
<td>EARTH 121/122, MATH 113A/B or MATH 115A/B; PHYS 121/122 or 121L/122L, CHEM 123/124 and 123L/124L, CS 102, MATH 114 or 111B.</td>
<td></td>
</tr>
<tr>
<td><strong>Co-operative Biology</strong> (see Notes 2 and 3)</td>
<td>Three or four 200-level term courses in BIOL, CHEM 123/124 and 123L/124L, CS 102.</td>
<td>PHYS 111/112, EARTH 121/122.</td>
</tr>
<tr>
<td><strong>Co-operative Biochemistry</strong> (see Notes 2 and 3)</td>
<td>Three or four 200-level term courses in BIOL, CHEM 125/126 and 123L/124L, MATH 115A/B, PHYS 121/122 and 121L/122L, CS 102.</td>
<td></td>
</tr>
</tbody>
</table>

**Note 1**
Co-op Physics students and those planning to enrol in Honours Physics in Year Two are advised to select MATH 130A/B instead of MATH 113A/B or 113A/B if they have more than an 80% average, and may select MATH 111 instead of MATH 134 if they have less than an 80% average in Grade 13 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 123/124 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-April) or (b) fall term on campus “4-stream” (September-December), winter term at work (January-April), and spring term on campus (April-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 (1B) and reschedule their MATH 111B to Year 2B and MTHEL 100 to 2A.
Academic Programs and Degree Requirements

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 2 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 Math.

Normally, 5.0 lecture credits per year are taken.

Year One

5.0 lecture credits, exclusive of laboratory credits. At least 2.0 credits must be chosen from the following list:

- BIOL 111/112, or two 200-level term courses;
- EARTH 121/122;
- CHEM 123/124 + labs;
- PHYS 111/112 or PHYS 121/122 + labs.

It is recommended that the required Math credit be taken in Year One.

Science courses recommended (other than Year One courses):


1) A student required to withdraw from an Honours Program in Chemistry who enrolls in the General Program is permitted to take no more than two lecture courses in Chemistry during the first term of study as a general degree student.
2) General Program students may not take Honours Chemistry Core Courses. Nor may they take 400-level courses and certain 300-level courses without the consent of the instructor.


Mathematics courses recommended

MATH 113A, 113B, 111A, 111B, 215 or 216; CS 100, 102, 210; STAT 204, 304 but not MATH 103/106.

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.
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 and an Honours Science and Business program. All are conducted through the regular system of study, and they all begin at the Year Two level. They are:

Program 1: Non-specialized (see below).
Program 2: Biology specialization (see page 14:17).
Program 3: Chemistry specialization (see page 14:24).
Program 4: Earth Sciences specialization (see page 14:27).
Program 5: Physics specialization (see page 14:29).
Liberal Science (see below).
Honours Science and Business (see below).

Honours Science (Non-Specialized) — Program 1
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 22.0 credits, exclusive of laboratory credits, with a cumulative overall average of 60%, and a cumulative average of 60% in all Faculty of Science courses. Of the 22.0 credits that are required:
   a) at least 20.0 must be lecture credits;
   b) at least 14.0 credits must be Faculty of Science credits, of which 10.0 must be at or above the 200 level, and at least 5.0 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) 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.

Science
Academic Programs and Degree Requirements

Year One
5.0 lecture credits, exclusive of laboratory credits must be obtained, of which 2.0 must be chosen from the following list:
   a) BIOL 111/112, or two 200-level courses;
   b) CHEM 123/124 plus labs;
   c) EARTH 121/122;
   d) PHYS 111/112, or PHYS 121/122 plus labs.

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, which has developed from a restructuring of the General Science 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. 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 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 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 credits exclusive of lab credits with a cumulative average of 60%, including:
   a) 2.5 credits in Core Courses
   b) 1.0 credit in SCI 468A and B
   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
1. 2.0 credits in sequences of upper year courses, plus
2. 2.0 credits in other upper year courses in those two Science disciplines
3. 3.0 credits in languages, humanities or social sciences courses.

The remaining 7.5 credits may be freely selected in consultation with an advisor.

2) Apart from the required SCI 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) A student 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 Core Courses or acceptable equivalents.)

The following is a list of courses from which students are advised to choose:

**Core Courses**

SCI 260, 261, 263, 265, 267.

**Year One Offerings**

BIOL 230, 233
CHEM 123, 123L, 124, 124L
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, 337 + 338
CHEM 212 or 218 + 312 or 313, 237 + 332 or 333, 266 + 267, 356 + 357 with the appropriate lab course: CHEM 314L, 237L, 266L, 356L respectively

**Suggested additional Upper Year courses:**

BIOL 239, 250, all other 300-level courses, 420, 424, 441, 443, 444, 448, 449, 450, 456, 457, 460, 461, 473
CHEM any other 200- or 300-level courses subject to prerequisites and antirequisites
EARTH 331, 332, 333, 336, 342, 346, 370
PHYS any other 200- or 300-level courses subject to prerequisites and antirequisites
SCI 250, 255, 355, 453, 454, 462

**Honours Science and Business**

As high technology plays an increasingly greater role in society, there will be a growing need for graduates who have a 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, organizational behaviour to name a few areas 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.

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 24.0 credits, with a cumulative average of 65% in both Science courses and non-Science courses. Of the 24.0 credits required:
   a) at least 12.0 credits must be Faculty of Science credits;
b) the 5.0 credits from Groups A and B must be included in the 12.0 credits; providing an introductory background in Biology, Chemistry, Earth Sciences and Physics;

c) 7.0 of the 12.0 credits must be selected from Group C. Of these at least 2.0 must be at the 300 or 400 level and no more than 4.0 may be taken from any particular discipline. Consult the undergraduate officer in the particular discipline regarding the appropriateness of a given sequence of courses.

2) No more than 5.0 failed credits are allowed.
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.

Honours Science and Business
Advisor: Prof. R. Aziz

**Year One**

<table>
<thead>
<tr>
<th>Fall</th>
<th>Winter</th>
</tr>
</thead>
<tbody>
<tr>
<td>BUS 111W (0.5)</td>
<td>BUS 121W (0.5)</td>
</tr>
<tr>
<td>MATH 113A (0.5)</td>
<td>MATH 119B (0.5)</td>
</tr>
<tr>
<td>CS 100 or elective* (0.5)</td>
<td>CS 102 (0.5)</td>
</tr>
<tr>
<td>1.0 Science lecture credit from Group A (with lab courses where specified)</td>
<td>1.0 Science lecture credit from Group B (with lab courses where specified)</td>
</tr>
</tbody>
</table>

*Students with no computer literacy should take CS 100 before 102*

**Year Two**

<table>
<thead>
<tr>
<th>Fall</th>
<th>Winter</th>
</tr>
</thead>
<tbody>
<tr>
<td>MTHEL 100 (0.5)</td>
<td>MATH 111B (0.5)</td>
</tr>
<tr>
<td>ECON 101 (0.5)</td>
<td>ACC 122 (0.5)</td>
</tr>
<tr>
<td>ACC 121 (0.5)</td>
<td>ECON 102 (0.5)</td>
</tr>
<tr>
<td>1.0 Science lecture credit from Group A (with lab course where specified)</td>
<td>1.0 Science lecture credit from Group B (with lab course where specified)</td>
</tr>
<tr>
<td>Group C Science elective (0.5)</td>
<td>Group C Science elective (0.5)</td>
</tr>
</tbody>
</table>

**Year Three**

<table>
<thead>
<tr>
<th>Fall</th>
<th>Winter</th>
</tr>
</thead>
<tbody>
<tr>
<td>BUS 352W (0.5)</td>
<td>BUS 362W (0.5)</td>
</tr>
<tr>
<td>M SCI 211 (0.5)</td>
<td>M SCI 432 (0.5)</td>
</tr>
<tr>
<td>ECON 221 (0.5)</td>
<td>CS 330 (0.5)</td>
</tr>
<tr>
<td>Group C Science elective (1.5)</td>
<td>Group C Science elective (1.5)</td>
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</tbody>
</table>

**Year Four**

<table>
<thead>
<tr>
<th>Fall</th>
<th>Winter</th>
</tr>
</thead>
<tbody>
<tr>
<td>BUS 454W (0.5)</td>
<td>BUS 491W (0.5)</td>
</tr>
<tr>
<td>BUS 481W (0.5)</td>
<td>ACC 372 (0.5)</td>
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<td>ACC 371 (0.5)</td>
<td>M SCI 331 (0.5)</td>
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<tr>
<td>Group C Science elective (1.5)</td>
<td>Group C Science elective (1.5)</td>
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**Science**

**Academic Programs and Degree Requirements**

- **Group A Science Courses**
  CHEM 123 + 123L; PHYS 111 + 111L or PHYS 121 + 121L; BIOL 230; EARTH 121

- **Group B Science Courses**
  CHEM 124 + 124L; PHYS 112 + 112L or 122 + 122L; BIOL 233; EARTH 122.

- **Group C Science Courses**
  CHEM 212 or 218; 237, 237L; 266, 266L; 267, 312, 313, 314L, 332, 333, 356, 356L; and 357.
  PHYS 256, 256L; 253, 253L; 352, 352L; 353, 353L; 368, 369, 380 and 381.
  SCI 250, 251, 260, 261, 263.

**B. HONOURS MAJOR PROGRAMS**

Honours major programs are offered through the Regular and/or Co-operative system of study. The specific programs that are offered are as follows:
- Honours Biology – Regular and Co-operative
- Honours Biochemistry – Regular and Co-operative
- Honours Biochemistry (Biotechnology Option) – Regular and Co-operative
- Honours Biology and Man-Environment Studies – Regular
- Honours Chemistry – Regular and Co-operative Applied (also with Options)
- Honours Chemistry and Man-Environment Studies (Regular)
- Honours Earth Science – Regular (Geology or Geography), and Co-operative Applied (Geology or Geophysics)
- Honours Physics – Regular, Co-operative applied, and Co-operative applied (Geophysics)
- Honours Psychology – Regular

Admission to all Co-operative programs is normally at Year One. Regular Honours programs begin at the Year Two level.

The Year Two Honours Chemistry programs (including Co-op Applied Chemistry and Honours Biochemistry) are normally limited by the available physical facilities to the best qualified students. Those who have failed core courses should not expect to proceed in any Honours Chemistry Program.

Enrolment is limited to approximately 45 students in Year Two of all Earth Sciences programs. Selection is made on the basis of academic standing in Year One, including standing in Earth 121 and 122.

Refer to the specific departmental sections for the degree requirements of the above programs.
Departmental Programs

Biology

The following programs are offered in the Biology department:

Honours Major Programs

Regular:
Honours Biology
Honours Biochemistry
Honours Biochemistry (Biotechnology Option)
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 Science Program 2 (with specialization in Biology)

Minor in Biology

HONOURS MAJOR PROGRAMS - REGULAR

Honours Biology
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 23.0 credits.
2) At least a 0.75 credit in Biochemistry and a 0.75 credit in Organic Chemistry beyond Year One;
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) 1.0 (or 1.5) Biology credits from the following: BIOL 210, 211, 220, 221, 230, 233, 239, 240, 241, 250;
2) CHEM 123 and 123L, and CHEM 124 and 124L;
3) Six (or five) electives (2.5 - 3.0 credits)

Honours Biochemistry

Program Advisors: Professors L.J. Brubacher, Chemistry and D.G. Dixon, 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 on 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 23.5 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.

Note:
Students who plan to take one or more of the Chemical Engineering electives in Year Four of the Biotechnology option, should take the prerequisite MATH 215 or MATH 216 in Year Two or Year Three.
Year One
1) 1.0 Biology credit from: BIOL 210, 211, 220, 221, 230, 233, 239, 240, 241, 250;
2) CHEM 125 and 123L, and 126 and 124L
3) PHYS 121/122 and 121L/122L or 111/112 and 111L/112L;
4) MATH 113A/B;
5) CS 102;
6) Elective (0.5 credit)

Year Two
Fall:
1) 0.5 credit from: BIOL 210, 220, 230, 240, 250;
2) CHEM 212, 220, 220L, 284;
3) STAT 202.
Winter:
1) 1.0 credit from: BIOL 211, 221, 233, 239, 241;
2) CHEM 221, 221L, 237, 237L*, 265, 265L.
   *may be taken in Year Three

Year Three
Fall:
1) 1.0 credit from: BIOL 316, 323, 324, 327, 330, 336, 337, 342, 350;
2) CHEM 332, 356, 366, 368L.
Winter:
1) 1.0 credit from BIOL 311, 315, 331, 333, 335, 338, 344, 356;
2) CHEM 333, 334L, 356L, 357, 357L
3) One elective (0.5)
Note:
BIOL 461 is available to students in Year Three or Year Four.

Year Four
Fall:
1) 1.5 credits from: 400-level BIOL courses, CHEM 432, 435, 452 or 492A*
2) CHEM 312, 464.
Winter:
1) 2.0 credits from: 400-level BIOL courses, CHEM 419, 433, 434, 492B*
2) One elective (0.5)
   *Students electing CHEM 492A/B must earn 5.5 credits in Year Four.

Honours Biology and Environment and Resource Studies
Honours Biology and Geography
Program Advisor: D.G. Dixon, 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 23.0 credits.
2) Of the 23.0 credits required, 7.5 credits must be approved by the Dept. of Biology, and 6.5 credits beyond Year One must be in the appropriate department of the Faculty of Environmental Studies, or equivalent;
3) STAT 202;
4) CHEM 123/123L, CHEM 124/124L, 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.

Since proper course selection in either program is critical, contact Professor D.G. Dixon, Biology, for further details.

HONOURS MAJOR PROGRAMS - CO-OPERATIVE PROGRAMS

Honours Co-operative Biology
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 23.0 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) Four satisfactory work-term reports.
4) 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 233 and 239 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.
Stream 8
(Students who take Year 1B during Winter Term)

<table>
<thead>
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<th>Spring</th>
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<tbody>
<tr>
<td>Year 1A</td>
<td>Year 1B</td>
<td>Work Term</td>
</tr>
<tr>
<td>BIOL 230</td>
<td>BIOL - 1.0 or 1.5</td>
<td>200-level credits.</td>
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<td>BIOL 240</td>
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<tr>
<td>CHEM 123/123L</td>
<td>CHEM 124/124L</td>
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<tr>
<td>Electives -</td>
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<tr>
<td>1.0 credits.</td>
<td>1.0 or 0.5 credits.</td>
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<tr>
<th>Year 2A</th>
<th>Work Term</th>
<th>Year 2B</th>
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</thead>
<tbody>
<tr>
<td>BIOL - 1.5 200-level credits.</td>
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<td>BIOL - 1.0 or 1.5 200-level credits.</td>
</tr>
<tr>
<td>CHEM 266/266L</td>
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<td>CHEM 237/237L</td>
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<tr>
<td>STAT 202</td>
<td>Electives -</td>
<td>1.5 or</td>
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Stream 4
(Students who take Year 1B during Spring Term)

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<tbody>
<tr>
<td>Year 1A</td>
<td>Work Term</td>
<td></td>
</tr>
<tr>
<td>BIOL 230</td>
<td>BIOL - 1.0 or 1.5</td>
<td>200-level credits.</td>
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<td>BIOL 240</td>
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<tr>
<td>CHEM 123/123L</td>
<td>CHEM 124/124L</td>
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<td>Electives -</td>
<td>Electives -</td>
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<td>1.0 credits.</td>
<td>1.0 or 0.5 credits.</td>
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<tr>
<th>Year 2A</th>
<th>Work Term</th>
<th>Year 2B</th>
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<tbody>
<tr>
<td>BIOL - 1.0 or 1.5 200-level credits.</td>
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<td>BIOL - 1.0 or 1.5 200-level credits.</td>
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<tr>
<td>CHEM 266/266L</td>
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<td>CHEM 237/237L</td>
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<tr>
<td>CHEM 228</td>
<td>Electives -</td>
<td>1.5 or</td>
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<td>Electives -</td>
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<th>Work Term</th>
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<tbody>
<tr>
<td>BIOL - 2 300-level credits.</td>
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<tr>
<td>CHEM 228</td>
<td>Electives -</td>
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<td>Electives -</td>
<td>0.5 credit. (CHEM 267 is recommended.)</td>
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<table>
<thead>
<tr>
<th>Year 3B</th>
<th>Work Term</th>
<th>Work Term</th>
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<tbody>
<tr>
<td>BIOL - 2 300-level credits.</td>
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<tr>
<td>Electives - 1.0 credit. (Biochemistry courses are recommended)</td>
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Stream 4 and Stream 8

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<th>Spring</th>
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<tr>
<td>Year 4A</td>
<td>Year 4B</td>
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<tr>
<td>BIOL - 1.5 400-level credits.</td>
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<tr>
<td>Electives - 1.0 credit.</td>
<td>Electives - 1.0 credit.</td>
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<td>(Biochemistry courses are recommended)</td>
<td>(Biochemistry courses are recommended).</td>
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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.

Note:
Some 400-level Biology courses may be taken in the third year.

Honours Co-operative Biochemistry
Program Advisors: Professors L.J. Brubacher, Chemistry and D.G. Dixon, 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 on 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 23.5 credits (including all required labs in Chemistry and Physics).
2) By the end of Year 2B, students should have completed BIOL 230, 233, 239, 240 and 241.
3) Four satisfactory work-term reports.

Notes:
1) Students should be aware that BIOL 233 and 239 must be taken during either the Winter or Spring Terms in even-numbered years and BIOL 241 must be taken during either the Winter or Spring Terms in odd-numbered years. Students entering in the Fall of odd-numbered years will take the same courses as listed below but in a slightly different sequence.
2) Students who plan to take one or more of the Chemical Engineering electives in Year Four of the Biotechnology option, should take the prerequisite MATH 215 or MATH 216 in Year Two or Year Three.
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<td><strong>Fall</strong></td>
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<td><strong>Spring</strong></td>
<td><strong>Work Term</strong></td>
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<tr>
<td>Year 1A</td>
<td>BIOL 230</td>
<td>CHEM 125/123L</td>
<td>BIOL 233</td>
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<td>BIOL 240</td>
<td>CHEM 212</td>
<td>CS 102</td>
<td>CHEM 126/124L</td>
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<td>MATH 115A</td>
<td>PHYS 121/121L</td>
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<td><strong>Work Term</strong></td>
<td><strong>Year 2B</strong></td>
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<tr>
<td>BIOL 240</td>
<td>BIOL 241</td>
<td>CHEM 221/221L</td>
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<td>CHEM 220/220L</td>
<td>CHEM 237/237L</td>
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<td>CHEM 264</td>
<td>CHEM 265/265L</td>
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<td>BIOL 331</td>
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<td>BIOL 331</td>
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<td>BIOL - 0.5 300 level credit.</td>
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<td>BIOL 333</td>
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<td>CHEM 333</td>
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<td>CHEM 337</td>
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<td>CHEM 357</td>
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<td>CHEM 366/368L</td>
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<td><strong>Year 3B</strong></td>
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<td>BIOL 330</td>
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<td>CHEM 332/334L</td>
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<td>CHEM 358</td>
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<td>CHEM 125/123L</td>
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<td><strong>Year 2A</strong></td>
<td><strong>Work Term</strong></td>
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<td>BIOL 241</td>
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<td>BIOL 330</td>
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<td>CS 102</td>
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<td>CHEM 212</td>
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<td>CHEM 220/220L</td>
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<td>CHEM 264</td>
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<td>CHEM 368/368L</td>
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<td><strong>Year 2B</strong></td>
<td><strong>Work Term</strong></td>
<td><strong>Year 3A</strong></td>
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<td>CHEM 221/221L</td>
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<td>BIOL 331</td>
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<td>CHEM 237/237L</td>
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<td>Elective (0.5)</td>
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<td>CHEM 368/368L</td>
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<td><strong>Work Term</strong></td>
<td><strong>Year 3B</strong></td>
<td><strong>Work Term</strong></td>
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<td>BIOL 331</td>
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<td>BIOL 331</td>
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<td>CHEM 333/334L</td>
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<td>CHEM 357</td>
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<td>Elective (0.5)</td>
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**Honours Co-operative Biochemistry (Biotechnology Option)**

*Students electing CHEM 492 must earn 5.5 credits in Year Four.*
Year 4A  
BIOL 480  
BIOL 443  
CHEM 312  
CHEM 356L  
CHEM 464  
One recommended elective (0.5)

Year 4B  
BIOL 439  
CHEM 357L

Spring  
Year 3A  
BIOL 330  
BIOL 342  
BIOL 350  
CHEM 332  
CHEM 356

Notes:  
1) Recommended electives:  
   BIOL 432, 434, 481  
   CH E 560, 561, 563 (one of MATH 215 or 216 must be taken as a prerequisite).  
   CHEM 419, 432, 433, 434, 435  
2) Students may prepare in writing some variation in this program for approval by the Biology and Chemistry undergraduate advisors to accommodate their special interest.

HONOURS SCIENCE PROGRAM 2 (WITH SPECIALIZATION IN BIOLOGY)  
Admission to, and continuance in, Honours Science - Program 2 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 23.0 credits.  
   Of the 23.0 credits that are required:  
   a) at least 20.0 must be lecture credits;  
   b) at least 14.0 must be Faculty of Science credits;  
2) at least 0.75 credit of biochemistry and 0.75 of organic chemistry beyond Year One;  
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) 1.0 credit from the following: BIOL 210, 211, 220, 221, 230, 233, 239, 240, 241, 250;  
2) CHEM 123/123L and CHEM 124/124L;  
3) CS 102;  
4) Electives (2.5).

Year Two  
1) 3.0 credits from BIOL 210, 211, 220, 221, 230, 233, 239, 240, 241, 250;  
2) CHEM 266/266L and 237/237L;  
3) Electives (2.0).

Year Three  
1) 3.0 credits from BIOL 311, 315, 316, 323, 324, 327, 330, 331, 333, 335, 336, 337, 338, 342, 344, 350, 356;  
2) 1.0 credit in Science;  
3) Electives (2.0).

Note:  
BIOL 461 is available to students in Year Three or Year Four.

Year Four  
1) 4.0 Science credits at least 2.0 of which are Biology credits from the 400-level or the list of 300-level courses above;  
2) Electives (1.0).

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 third or fourth year level. A minimum average of 65% is required in BIOL courses.
Chemistry

The following programs are offered in the Chemistry department:

Honours Major Programs

Regular:
Honours Biochemistry - (see page 14.13)
Honours Biochemistry, Biotechnology Option – (see page 14.16)
Honours Chemistry
Honours Chemistry and Environment and Resource Studies
Honours Chemistry (with Options)
  a) Environmental Studies Option
  b) Mathematics Option
  c) Physics Option
  d) Thesis Option

Co-operative:
Honours Co-operative Biochemistry - (see page 14:15)
Honours Co-operative Biochemistry, Biotechnology Option – (see page 14:16)
Honours Co-operative Applied Chemistry
Thesis Option (available for any Co-operative program)

Honours Science – Program 3 (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 66% 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, 366

Electives
The following chart 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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(b) Electives Relevant to Industrial Employment

Students contemplating careers in industry should consider some of these subjects and courses:

<table>
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<tr>
<th>Statistics</th>
<th>STAT 204, 304</th>
<th>Writing</th>
<th>SCI 209, ENGL 210A or C</th>
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<tr>
<td>Environment</td>
<td>ERS 320</td>
<td>Law</td>
<td>P SCI 291, 292, ENV S 201, ACC 231</td>
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<td>Management Science</td>
<td>M SCI 211</td>
<td>Business (WLI)</td>
<td>RUS 352, 362, 382, 383</td>
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<td>Economics</td>
<td>ECON 101, 102, 201, 202</td>
<td>Accounting</td>
<td>ACC 121, 122</td>
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<td>Computing</td>
<td>CS 235, 234, GEN E 121</td>
<td>Microprocessors</td>
<td>EL E 222, 323, 427, PHYS 353</td>
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<td></td>
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<td>Critical Thinking</td>
<td>PHIL 145</td>
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Notes:
* indicates recommendation for Applied Chemistry students.
† indicates special permission required from the Associate Chairman for Undergraduate Studies in the Chemical Engineering Department.
‡ indicates strong recommendation for all Chemistry major students.
HONOURS MAJOR PROGRAMS - REGULAR

Honours Biochemistry
(see page 14.13)

Honours Biochemistry (Biotechnology Option)
(see page 14.16)

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 non-elective lecture courses each term.

In order to graduate with an Honours Chemistry degree, the following requirements must be met:

1) Successful completion of 24.75 credits including 5.75 lab credits.
2) In Years Three and Four, students must choose four 400-level term courses (other than CHEM 407) and two term lecture courses at any level from the list of Technical electives with Chemistry content (see page 14.19);
3) Failure of more than one course in the field of specialization will result in the requirement to withdraw from the program;
4) 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;
5) Mandatory courses as listed below.

Year One
Students entering Year One must take:
Fall:
1) CHEM 125/123L
2) PHYS 121/121L
3) MATH 113A
4) CS 102 (Fall or Winter)
5) Electives (1.0 or 0.5)
Winter:
1) CHEM 126/124L
2) PHYS 122/122L
3) MATH 113B
4) Electives (1.0 or 0.5)

Year Two
Students entering Year Two must take:
Fall:
1) CHEM 10, 220, 220L, 254, 264
2) MATH 215
3) PHYS 249, 249L
Winter:
1) CHEM 10, 212, 221/221L, 255, 265/265L
2) Elective (0.5)

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 the non-elective 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 23.75 approved credits including 4.25 lab credits;
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
1) CHEM 125/126, 123L124L
2) ERS 100, 101, 150, 151
3) BIOL - two 200-level courses
4) MATH 115AIB
5) CS 102
6) ENV S 195 (0.5)

Upper Years
1) CHEM - 7.5 lecture credits including CHEM 212, 220, 221, 237, 264, 265, 356, 357, 368, and 3.0 lecture credits from appropriate 300- and 400-level courses in the Chemistry Department;
2) ERS - 12 courses (to be selected in consultation with the Department of Environment and Resource Studies)
3) MATH 215
4) STAT 202
5) 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 non-elective 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 24.0 credits including 5.0 lab credits;
2) 4.0 credits from the Environmental Studies Option course list (or courses approved by the Undergraduate Dean of Environmental Studies);
3) Failure of more than one course in the field of specialization will result in the requirement to withdraw from the program;
4) 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;
5) Mandatory courses as listed below.

ENVIRONMENTAL STUDIES OPTION COURSE LIST

Students must take ENV S 195.

In addition, 3.5 credits must be selected from both portions of the list below:

Legal, Economic and Social Aspects

ENV S 201, 202, 401, 411
ERS 320
PLAN 156, 222, 319

Resource Management

ENV S 200
GEOG 301, 303, 356, 357, 358, 359, 414
SCI 350

Year One

Students must take the same courses as stated in the Honours Chemistry program.

Year Two

Students must take the same courses as stated in the Honours Chemistry program (page 14.20)

Year Three

Students entering Year Three must take:

Fall:
1) CHEM 10, 312, 314L, 356L, 368/368L
2) STAT 204
3) One Elective (0.5)

Winter:
1) CHEM 10, 313, 357/357L
2) STAT 304
3) Two electives (1.0)

Year Four

Students entering Year Four must take:
1) CHEM 10, 419, 492A/B
2) ENV S 201
3) 2.0 CHEM credits. (CHEM 237/237L, 311, 320, 321L, 420, 452 and 455 are recommended)
4) 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 non-elective 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 23.75 credits including 4.75 lab credits:
2) Failure of more than one course in the field of specialization will result in the student being required to withdraw from the program;
3) 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;
4) Mandatory courses as listed below.

Year One

Students entering Year One must take

Fall:
1) CHEM 125/123L
2) PHYS 121/121L
3) MATH 115A, 114 (or 134B, Winter)
4) CS 102

Winter:
1) CHEM 126/124L
2) PHYS 122/122L
3) MATH 115B
4) Electives (2.0)
Year Two
Students entering Year Two must take:
Fall:
1) CHEM 10, 220/220L, 254, 264
2) One Elective (0.5)
3) PHYS 249/249L
Winter:
1) CHEM 10, 212, 221/221L, 255, 265/265L
2) MATH 210

Year Three
Students entering Year Three must take:
Fall:
1) CHEM 10, 312, 314L, 355/355L
2) MATH 216
3) CS 234
4) One Elective (0.5)
Winter:
1) CHEM 10, 358/358L
2) MATH 322B
3) PHYS 359, 365
4) One Elective (0.5)

Year Four
Students entering Year Four must take:
1) CHEM 10, 492A/B (1.5)
2) Three Chemistry Electives (1.5) mainly from 400-level courses
3) Three Mathematics Electives (1.5) from 300- or 400-level courses
4) Two other Electives (1.0)

C) HONOURS CHEMISTRY (PHYSICS OPTION)
Program Advisor: Professor J.W. Hepburn
This program combines the Honours Chemistry core with courses in physics. It is suitable preparation for work in Physical Chemistry or Chemical Physics, or for students whose interests divide between the two disciplines.

Students wishing to follow this program on the Cooperative system of study should first speak to Professor Hepburn and to Mr. R.A. Pullin of the Department of Co-operative Education and Career Services.

Admission to, and continuance in, Honours Chemistry (Physics Option) requires an overall cumulative average of 60%. In addition, a 60% average must be obtained in all non-elective lecture courses each term. A 60% average is required in all Physics courses.

In order to graduate with an Honours Chemistry (Physics Option) degree, the following requirements must be met:
1) Successful completion of 24.0 credits including 5.0 lab credits;
2) Failure of more than one course in the field of specialization will result in the requirement to withdraw from the program;
3) 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;
4) Mandatory courses as listed below.

Year One
Students entering Year One must take:
Fall:
1) CHEM 125/123L
2) PHYS 121/121L
3) MATH 115A, 111A
4) CS 102
Winter:
1) CHEM 126/124L
2) PHYS 122/122L
3) MATH 115B, 134B
4) Electives (1.0)

Year Two
Students entering Year Two must take:
Fall:
1) CHEM 10, 212, 220/220L, 254
2) PHYS 256/256L
3) MATH 216
Winter:
1) CHEM 10, 221/221L, 255
2) PHYS 253/253L, 263
3) MATH 210

Year Three
Students entering Year Three must take:
Fall:
1) CHEM 10, 264, 312, 355/355L
2) PHYS 352/352L
3) One Elective (0.5)
Winter:
1) CHEM 10, 265/265L, 358/358L
2) PHYS 359
3) Two Electives (1.0)

Year Four
Students entering Year Four must take:
1) CHEM 10, 492A/B (1.5)
2) PHYS 434, 454
3) Three chemistry electives (1.5), and two physics electives (1.0) (courses other than Chemistry and Physics, such as Chemical Engineering, Mathematics, or Applied Mathematics, may be acceptable, but permission must be given by the Undergraduate Officer)
4) One other elective (0.5) (suggested electives include PHYS 353/353L, 363, 432, 441 and 445).
D) HONOURS CHEMISTRY (THEESIS OPTION)

Program Advisor: Professor G.E. Toogood

Students who have achieved an average of 80% in all Chemistry courses, and 80% over all courses taken, may request to complete their degrees with a reduced course load and an increased research load. Admission is by interview after completion of Year Two in any Honours Chemistry program, regular or co-operative.

Years One and Two: as at present in any Honours Chemistry program

Years Three and Four: CHEM 355, 368 and one of 312/313, plus research courses. CHEM 392A/B and 495A/B.

Student performance is assessed by an advisory committee at the end of each academic term. Assessment is based on research-related activities (70%) and general knowledge of chemistry (30%), and a satisfactory performance in each category will be required.

HONOURS MAJOR PROGRAMS - CO-OPERATIVE

Honours Co-operative Biochemistry
(see page 14:15)

Honours Co-operative Biochemistry (Biotechnology Option)
(see page 14:16)

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 the non-elective 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 24.75 credits including 5.75 lab credits.
2) In Years Three and Four, students must choose four 400-level term courses (other than CHEM 407) and two term lecture courses at any level from the list of Technical Electives with Chemistry Content (see page 14:19);
3) Failure of more than one course in the field of specialization will result in the requirement to withdraw from the program;
4) Successful completion of a minimum of four work terms, and submission of a minimum of four satisfactory work reports;
5) Mandatory courses as listed below.

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Stream 4

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Both Stream 4 and Stream 8

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HONOURS SCIENCE PROGRAM 3 (WITH SPECIALIZATION IN CHEMISTRY)

Admission to, and continuance in, Honours Science Program 3 requires an overall cumulative average of 60%, and a cumulative average of 60% in all Chemistry courses.

In order to graduate with an Honours Science Program 3 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 0.5 lab credit and 1.0 lecture credit in each of the following areas of Chemistry: Analytical, Inorganic, Organic, Physical. 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 & 111L/112L or PHYS 121/122 & 121L/122L; CHEM 123/124 or 125/126, 123L/124L; MATH 113A/B, CS 102; Three Electives (1.5)

Year Two

Students entering Year Two must take:
1) 3.0 Chemistry lecture credits, at least 2.0 of which must be chosen from: CHEM 212, 220, 221, 254, 255, 264, 265;
2) 1.0 lecture credit chosen from Physics, Biology or Earth Sciences courses;
3) Two Electives (1.0)
4) CHEM 10.

Year Three

Students entering Year Three must take:
1) 3.0 Chemistry lecture credits at the 300-level or higher;
2) 1.0 lecture credit chosen from Physics, Biology or Earth Sciences courses;
3) Two Electives (1.0);
4) CHEM 10.

Year Four

1) 2.0 Chemistry credits at 300-level or higher (at least 1.0 at 400-level)
2) 2.0 lecture credits from Biology, Chemistry, Earth Sciences or Physics
3) Two Electives (1.0)
4) CHEM 10

MINOR IN CHEMISTRY

In order to graduate with a Minor in Chemistry the following requirements must be met:

1) The following courses must be taken, with a minimum cumulative average of 60% in these courses:
   a) CHEM 123/124 or 125/126, and CHEM 123L/124L;
   b) a minimum of 3.5 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;
   c) 0.5 lab credits beyond Year One appropriate to the lecture credits chosen.

Students are urged to check their plans with the 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 (Geography Option)

Co-operative:
Co-op Applied Earth Sciences (Geology Option)
Co-op Applied Earth Sciences (Geophysics Option)

Honours Science Program 4 (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:

<table>
<thead>
<tr>
<th>100-level</th>
<th>Co-op Earth Sciences/Geology Option</th>
<th>Co-op Earth Sciences/Geophysics Option</th>
<th>Honours Earth Sciences/Geology Option</th>
<th>Honours Earth Sciences/Geography Option</th>
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<tbody>
<tr>
<td>Sci. Math Core</td>
<td>7</td>
<td>10</td>
<td>7</td>
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<tr>
<td>Arts Core</td>
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<tr>
<td>Earth Sciences</td>
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<td>21</td>
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<tr>
<td>200-level</td>
<td>Math, CS or Physics</td>
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<td>-</td>
<td>-</td>
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<tr>
<td>Geography/Environmental Studies</td>
<td>-</td>
<td>-</td>
<td>10</td>
<td>-</td>
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<tr>
<td>Science/Mathematics Electives</td>
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<td>5</td>
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<td>2</td>
</tr>
<tr>
<td>Unrestricted Elective</td>
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<td>3</td>
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<td>Total Term Courses</td>
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<tr>
<td>Non-credit field courses</td>
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<td>2</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

*Excluding SCI courses; optional Labs must be taken. EARTH 358 is considered a Science/Mathematics elective.

Students who plan to do graduate work in hydrogeology are advised to take MATH 213A/B or CIV E 221 during their fourth year.

HONOURS MAJOR PROGRAMS - REGULAR

Honours Earth Sciences (Geology Option)

Year One
EARTH 121/122, CHEM 123/124 and 123L/124L, PHYS 121/122 and 121L/122L, CS 102, MATH 113A/B, one Elective.

Year Two
Students entering Year Two must take:
1) EARTH 221, 231, 232, 235, 236, 238, 260;
2) ENGL 210;
3) Two electives

Year Three
Students entering Year Three must take:
1) EARTH 331, 332, 333, 336, 342, 345, 355, 370, 390
2) Four electives

Year Four
Students entering Year Four must take:
1) EARTH 427, 490;
2) Seven* term courses from: EARTH 421, 432, 433, 434, 435, 436, 437, 438, 439, 440, 455, 460, 470;
3) Two electives, not from Earth Sciences.

* Upon approval from the Undergraduate Officer, a student may take six term courses from (2) above, to allow freedom to take courses in the Faculties of Mathematics, Engineering, or Science.

Honours Earth Sciences (Geography Option)

In addition to the requirements for all Honours Major programs listed on page 14:24, 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, CHEM 123/124 and 123L/124L, GEOG 101/102, CS 102, either PHYS 111/112 and 111L/112L or BIOL 111/112 or equivalent elective.

Year Two
Students entering Year Two must take:
1) EARTH 221, 231, 232, 235, 236, 238;
2) ENV S 200;
3) GEOG 201, 202
4) One elective

Year Three
Students entering Year Three must take:
1) EARTH 331, 332, 333, 336, 342, 345, 370, 390;
2) ENGL 210C;
3) Two GEOG electives;
4) Two unrestricted electives
**Year Four**

Students entering Year Four must take:
1. EARTH 427, 440, 490, plus four term courses from 400-level EARTH courses;
2. Three GEOG electives from 300- or 400-level courses
3. One unrestricted elective

**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 5.3 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, CHEM 123/124 and 123L/124L, PHYS 121/122 and 121L/122L, CS 102, MATH 115A/B, 114 or 111B.

**Year Two**

2A students must take:
1) EARTH 231, 235, 260;
2) One elective

2B students must take:
1) EARTH 221, 232, 236;
2) ENGL 210C;
3) One elective

**Year Three**

3A students must take:
1) EARTH 333, 368, 360A or 460 (given alternate years), 370, 390;
2) One unrestricted elective

3B students must take:
1) EARTH 236, 355, 458;
2) Two electives from PHYS, MATH, CS or Engineering;
3) One Arts elective

**Year Four**

Students entering Year Four must take:
1) EARTH 360A or 460 (given alternate years), 427, 436A/B, 490;
2) Two electives from PHYS, MATH, CS or Engineering;
3) an additional four EARTH term courses from 300- or 400-level courses.

**Recommended Electives:**

STAT: 204, 220
PHYS: 246, 253, 256, 259, 352, 354, 364, 365
CS: 234, 235, 316, 337
CIV E: 375, 381, 472, 473, 480, 486
CH E: 571
CHEM: 212, 219, 254, 255, 265, 311, 312, 313
GEOG: 375, 376
HONOURS SCIENCE Program 4 (WITH SPECIALIZATION IN EARTH SCIENCES)
Admission to, and continuance in, Honours Science - Program 4 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:
   a) 20 must be EARTH courses;
   b) Eight must be other Science courses (excluding SCI courses);
   c) Three must be from Computer Science and Mathematics;
   d) Three must be from Arts
   e) Eight are unrestricted electives.

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:
1) EARTH 121/122;
2) CHEM 123/124 and 123L/124L;
3) PHYS 111/112 and 111L/112L, or two 100- or 200-level BIOL term courses;
4) MATH 113A/B;
5) CS 102

Year Two
Students entering Year Two must take a total of ten term courses, which must include:
1) EARTH 221, 231, 232, 235, 236, 236;
2) ENGL 210C;
3) Two other Science term courses

Year Three
Students entering Year Three must take a total of 12 term courses, which must include:
1) Six or eight term courses from: EARTH 260, 331, 332, 333, 336, 342, 345, 355, 360A or 460, 370;
2) Two other Science term courses;
3) Two or one Arts term courses.

Year Four
Students entering Year Four must take a total of ten term courses, which must include:
1) 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 courses.
2) The required credits must include:
   a) EARTH 121/122 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, 360A, 368, 369, 370 in Year Three;
   d) 0.5 or 1.0 credits from: EARTH 421, 432, 433, 434, 435, 438, 439, 440, 470 in Year Four.

Physics
The following programs are offered in the Physics department:

Honours Major Programs
Regular:
Honours Physics
Honours Physics (Geophysics Option)
Co-operative:
Honours Co-op Applied Physics
Honours Co-op Applied Physics (Geophysics Option)

Honours Science Program 5 (with a specialization in Physics)

Minor in Physics

HONOURS MAJOR PROGRAMS - REGULAR

Honours Physics
The Honours program is in the form of a core of required courses, plus appropriate electives. By careful selection of electives, students can deepen their knowledge of experimental or theoretical physics, or obtain a background in another subject (e.g. Astronomy, Geophysics, Chemistry, Mathematics, Computing, Business Administration). Examples of possible elective programs are available in the office of the undergraduate advisors.

Admission to, and continuance in, Honours Physics requires an overall cumulative average of 60% and a 60% Physics average each year.

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.
Students entering Year One must take:

**Fall:**
1) PHYS 121/121L, 123
2) MATH 115A or 113A
3) MATH 111A or 134A
4) Electives (0.5)

**Winter:**
1) PHYS 122/122L
2) MATH 115B or 113B
3) MATH 111B or 134B
4) Electives (1.0)

**Year Two**

Students entering Year Two must take:

**Fall:**
1) PHYS 10, 254, 256/256L
2) MATH 213A, 216
3) One Elective (0.5)

**Winter:**
1) PHYS 10, 253/253L, 263
2) MATH 213B
3) Two Electives (1.0)

**Year Three**

Students entering Year Three must take:

**Fall:**
1) PHYS 10, 354, 358, 360A, 364
2) One Elective (0.5)
3) One Elective lab (0.25)

**Winter:**
1) PHYS 10, 359, 360B, 363, 365
2) One Elective (0.5)
3) One Elective lab (0.25)

**Year Four**

Students entering Year Four must take a total of 5.0 credits, which must include the following:

1) PHYS 10, 434, 441, 455, plus an additional 1.0 credit of PHYS electives. PHYS 437A and PHYS 454 are strongly recommended for students intending to do graduate work. PHYS 443 is recommended for students intending to do graduate work or intending to work as industrial physicists.

**Honours Physics (Geophysics Option)**

In order to graduate with an Honours Physics (Geophysics Option) degree, the academic requirements listed on page 14:29 under Honours Co-op Applied Physics (Geophysics Option) must be met.

**Elective Programs**

The "Core plus elective" structure of the Honours Physics program allows a great many combinations of courses to be taken. Commonly taken combinations of courses which emphasize various aspects of physics such as experimental physics, theoretical physics, biophysics, astrophysics, as well as physics in combination with such studies as Business Administration, Computing, Electrical Engineering, are kept on file in the office of the undergraduate advisor. Students may obtain a copy on request. All such programs are subject to timetable restrictions.

**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 who 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 Co-ordination Department 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 with emphasis on such topics as Solid State, Biophysics, Chemistry and Physics, Physics with Computing, Physics with Business Administration, Physics with Electrical Engineering, etc. All are based on the common core of courses as outlined below. Typical examples of several combinations of courses, which supplement the core, are kept on file in the office of the undergraduate advisor, from whom copies are available. 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 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
Students entering Year One must take:
1A Fall:
1) PHYS 121/121L, 123
2) MATH 115A, 111A or 134A
3) Electives (0.5)
1B Winter or Spring:
1) PHYS 122/122L
2) MATH 115B, 111B or 134B
3) Electives (1.0)

Year Two
Students entering Year Two must take:
2A (Fall):
1) MATH 213A or 230A
2) MATH 216 or AM 260
3) PHYS 10, 254, 256/256L
4) One Elective (0.5)
2B (Spring):
1) MATH 213B or 230B
2) PHYS 10, 253/253L, 263
3) Two electives (1.0)

Year Three
Students entering Year Three must take:
3A (Spring):
1) PHYS 10, 354, 358, 360A, 364
2) One Elective (0.5), and one Elective lab (0.25)
3B (Winter):
1) PHYS 359, 360B, 363, 365
2) One Elective (0.5), and one Elective 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):
1) PHYS 10, 434, 441, 455, plus an additional 1.0 credit of PHYS electives. PHYS 437A and PHYS 454 are strongly recommended for students intending to do graduate work. PHYS 443 is recommended for students intending to do graduate work or intending to work as industrial physicists.

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 20.5 lecture credits, plus 2.0 physics lab credits.
2) Mandatory courses as listed below.

Year One
Students entering Year One must take:
1A (Fall):
4) PHYS 121/121L
2) CHEM 123/123L
3) EARTH 121
4) MATH 114, 115A
4B (Winter or Spring):
1) PHYS 122/122L
2) CHEM 124/124L
3) EARTH 122
4) CS 102
5) MATH 115B

Year Two
Students entering Year Two must take:
2A (Fall):
1) PHYS 10, 254, 256/256L
2) MATH 213A, 216
3) EARTH 231, 260
2B (Spring):
1) PHYS 10, 253/253L, 263
2) MATH 2138
3) EARTH 232, 238

Year Three
Students entering Year Three must take:
3A (Winter):
1) PHYS 10, 259/259L, 363, 365, 360B
2) EARTH 369, 370
3B (Fall):
1) PHYS 10, 354, 358, 364
2) EARTH 235, 236

Year Four
Students entering Year Four must take:
4A & B (Fall & Winter):
1) PHYS 10, 352/352L*, 353/353L*, 437A, 441, 443, 455
2) EARTH 460, 461
*PHYS 352/352L, 353/353L may be replaced by PHYS 464, 465

HONOURS SCIENCE PROGRAM 5 (WITH A SPECIALIZATION IN PHYSICS)
Admission to, and continuance in, Honours Science Program 5 requires an overall cumulative average of 60%, and a Physics average of 60%.

In order to graduate in the Honours Science program, with a specialization in Physics, the following requirements must be met:

1) Successful completion of 22.0 credits. Of the 22.0 credits that are required, 14.0 must be Faculty of Science credits;
2) No more than 5.0 failed credits will be allowed;
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:
- **Fall:**
  1) PHYS 121/121L
  2) MATH 115A or 113A
  3) MATH 111A or 134A
  4) Electives (1.0)
- **Winter:**
  1) PHYS 122/122L
  2) MATH 115B or 113B
  3) MATH 111B or 134B
  4) Electives (1.0)

**Year Two**
Students entering Year Two must take:
1) PHYS 253/253L, 254, 256/256L, 263
2) MATH 213A/B, 216, or equivalent

**Years Three and Four**
Students in Years Three and Four must take:
1) At least 2.5 lecture credits of Honours Physics core courses at the 300- or 400-level and an additional 3.5 lecture credits of Physics courses at the 300- or 400-level, of which PHYS 354 and 455 must be included.

**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, 253, 226/246 or 256, 324/325 or 263/354;
3) Lab credits must include: PHYS 121L/122L, and 0.5 credits of Year Two labs.

**Honours Psychology**

The BSc Psychology program is designed for students intending to pursue graduate studies in the neurosciences or professional training in medicine (specialization in neurology, psychiatry or pediatrics, for example) or even veterinary science. It provides students with a background in natural sciences sufficient to understand the physical, chemical and biological aspects of sensory processes, neural transmission and higher mental functions.

Admission to, and continuance in, Honours Psychology requires a cumulative average of 60% in the Faculty of Science courses and a cumulative average of 75% in the Psychology courses.

In order to graduate with an Honours Psychology degree, the following requirements must be met:
1) Successful completion of 23.0 credits.
2) In Years Two, Three and Four, a total of 5.0 Science credits, 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.

**Year One**
Two 200-level term courses in BIOL; CHEM 123/124, 123L/124L; PHYS 111/112, 111L/112L or PHYS 121/122, 121L/122L; MATH 113A/B; PSYCH 101, one PSYCH elective

**Year Two**
Students entering Year Two must take the following:
1) PSYCH 291 and 292
2) One of: PSYCH 203, 206, 207, 261, 271
3) One of: PSYCH 211, 253, 355, 357
4) Two PSYCH Electives (1.0)
5) Four Science Electives (2.0)
6) Two unspecified Electives (1.0)

**Year Three**
Students entering Year Three must take the following:
1) PSYCH 391
2) Two of: PSYCH 392, 393, 394, 395, 396, 397, 398
3) One of: PSYCH 203, 206, 207, 261, 271
4) One of: PSYCH 211, 253, 355, 357
5) One PSYCH Elective (0.5)
6) Four Science Electives (2.0)
7) Two unspecified Electives (1.0)

**Year Four**
Students entering Year Four must take the following:
1) PSYCH 499A/B (1.0)
2) Two PSYCH Electives (1.0)
3) Two Science Electives (1.0)
4) Four unspecified Electives (2.0)

*(check overlapping courses pg. 8:7)*

Students should consider prerequisites for third-year Psychology courses when selecting their courses for second year.

It is also recommended that honours students take at least two senior seminars or special topics courses (at the 300 or 400 level) in Psychology, from their PSYCH elective choices.
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 men and women 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 O.D. 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.

†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/zooology, calculus, chemistry, physics and psychology should be represented. At the University of Waterloo the following program or equivalent is recommended to students planning to apply to the first professional year: BIOL 230/230L, Cell Biology; BIOL 211, Vertebrate Zoology; CHEM 123/123L, Chemical Reactions, Equilibria and Kinetics; CHEM 124/124L, Introductory Organic Chemistry; PHYS 121/122, 121L/122L, General Physics; (students without Grade 13 Physics must take PHYS 111/112 and PHYS 111L/112L); MATH 113A/B, Calculus; PSYCH 101, Introductory Psychology. The above mentioned courses represent the minimum requirements for admission to the School of Optometry. The following courses represent a second year program of 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 246/246L, Physical Optics; PSYCH 200 or 292, or 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.

Admission Test
It is recommended but not required, that applicants take the Optometry College Admission Test (OCAT). Details of this test can be obtained from the Psychological Corporation, 7500 Old Oak Boulevard, Cleveland, OH 44130. USA.

The Admissions Committee will also consider applications from superior students who have completed other academic programs. In the event that applications from such students are successful, they may be expected to remedy specific deficiencies either during the summer preceding admission or during the regular professional program.

Selection Factors
All applicants should note that enrolment in the first professional year is limited to 60 and that in 1986 there were approximately 400 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 scholarship, interest, motivation, general qualifications for the profession and recommendations.

While admissions of well qualified applicants are made from all the provinces, prospective students are advised that some preferential consideration must be given to Ontario residents. Preferential consideration is also given to applicants completing their pre-professional program at the University of Waterloo, but applicants to Year One Regular Science 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 Year One Regular Science as given at the University of Waterloo.

The provinces of Alberta, Manitoba, New Brunswick, Prince Edward Island and Saskatchewan have entered into an agreement with the province of Ontario and the University of Waterloo regarding admission of
applicants to the School of Optometry from those provinces. Under the terms of the agreement, the School of Optometry will accept in the first professional year, seven applicants who are residents of Alberta, three applicants who are residents of Manitoba, three applicants who are residents of Saskatchewan, one resident of New Brunswick and one resident every three years from P.E.I. In each year arrangements will be made to provide an opportunity for applicants from Alberta, Manitoba and Saskatchewan to be interviewed in their home provinces. Applicants from the five provinces must meet the same admission criteria as other applicants. The location of the university where studies have been undertaken is not a criterion in the selection of these applicants. Additional information may be obtained from the Admissions Office of the School of Optometry.

Application Procedures
Students enrolled at the University of Waterloo make application to the Optometry program by completing an application for internal transfer form obtained from the Admissions Office at the School of Optometry. Graduates of the University of Waterloo or persons who were at one time registered at the University of Waterloo in any type of program also apply by completing this form. In the winter term an interview with the admissions committee will be arranged for the student. Students who have completed the preprofessional program at another university must apply through the Ontario Universities Application Centre (OUAC). Such applicants should obtain the appropriate OUAC application form from the Registrar of the University of Waterloo. These forms will not ordinarily be available from the Registrar prior to October 1, 1987. The completed OUAC form should reach the Registrar at Waterloo by the deadline of February 28. After the OUAC form has been processed the applicant will receive a supplementary application package from the Registrar of the University of Waterloo, due in March. This will contain details on required transcripts, letters of reference and the curriculum vitae. The exact due date will be stated in this package. The deadline for receipt of academic transcripts is June 15. 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 of the School.

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 O.D. degree. For more information write: The Admissions Office, School of Optometry.

Note
Interviews with the Admissions Officer of the School are required in the case of applicants in certain categories before any application can be processed. These categories include:
1. Applicants with undergraduate or graduate training who have not completed prerequisites for the preprofessional 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 had been made.

Appointments for interviews can be made by phone or letter to the Admissions Officer 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 must be obtained each term. In Optometry 348A/B, 358 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.

Year One
Students entering Year One must take the following:
Fall term:
1) OPTOM 100, 104, 105, 106, 109;
2) BIOL 301A.
Winter term:
1) OPTOM 111, 114, 115, 116;
2) BIOL 301B.

Year Two
Students entering Year Two must take the following:
Fall term:
1) OPTOM 241, 242, 244, 245, 246, 261.
Winter term:
1) OPTOM 251, 252, 254, 255, 274.

Year Three
Students entering Year Three must take the following:
Fall term:
Winter term:
Year Four

Students entering Year Four must take the following:

Fall term:
1) OPTOM 440, 442, 448B, 449, 468, 480;
2) OPTOM 441 or PSYCH 357*.

Winter term:
1) OPTOM 448A, 452, 459, 490, 499 (A-E);
2) 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.
Interdisciplinary Options

Students in many General or Honours programs may select a specified group of courses from a number of disciplines to form an Interdisciplinary Option or Minor which will be designated on the diploma. Interdisciplinary Options or Minors are composed of courses selected from different disciplines which have a common focus on a particular theme or area of study.

For example, a student enrolled in Honours French might select courses in the Canadian Studies Option, or a student in Honours Biology might wish to take the Gerontology Minor.

Students should note that, in most cases, courses for an Option would be selected after Year One. The 11 Interdisciplinary Options now available are described below:

- Canadian Studies
- Gerontology
- Iberoamerican Studies
- Legal Studies
- Management Studies
- Middle East Studies
- Peace and Conflict Studies
- Personnel and Administrative Studies
- Society, Technology and Values
- Studies in Personality and Religion
- Women's Studies
Canadian Studies

Participating faculty members are listed in Chapter 16.

The Canadian Studies Option

The Canadian Studies Option gives students the opportunity to gain insight into Canada in three ways: through courses about Canada in their home discipline, courses about Canada in departments outside that discipline, and core interdisciplinary courses offered by the Canadian Studies Program Centre. The Centre is located at St. Paul's United College on the UW campus.

General and Honours Options

Students in Anthropology, Economics, English, French, Geography, History, Environment and Resource Studies, Political Science, Sociology, and Urban and Regional Planning are invited to consider the General or Honours Option in Canadian Studies.

Year One

Because 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, and they should otherwise proceed with their Faculty's usual Year One program.

Having chosen a main field of study from among the ten departments listed above, students can then select the Canadian Studies Option. Those in a three-year General degree program choose the General Option, while those in a four-year Honours program select the Honours Option. The difference in the two Options is simply that Honours students complete the fourth year (see below).

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 p. 15:4)
- the equivalent of four term courses chosen to meet the Honours requirement in the home discipline

Interdisciplinary Options

Canadian Studies

Year Three

- two of CDN ST 301, 302, 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 p. 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 p. 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. This requires assembling a package equivalent to ten term courses. The package includes four of CDN ST 101, 201, 202, 301, 302 and 365 plus six term courses from the approved course list on p. 15:4.
Principal Canadian Content Courses Offered by Participating Departments

Anthropology (ANTH)
102A Introduction to Social and Cultural Anthropology
203 Prehistoric Man in North America
230 Indians of Canada
233 Inuit & Eskimo Cultures
241 The Contemporary Canadian Indian Scene
322 Prehistoric Man in the Great Lakes Area
377 Early Man in the New World
499 Honours Essay

Economics (ECON)
101 Introduction to Micro-economics
102 Introduction to Macro-economics
241 Cost-Benefit Analysis and Project Evaluation
263 History of Canadian Economic Development
333 Interregional Economics
341 Public Finance
343 Urban Economics
345 Industrial Organization
351 Labour Economics
353 Population Economics
355 Economics of Energy and National Resources
364 Contemporary Canadian Problems

English (ENGL)
205R The Canadian Short Story
214 Themes in Canadian Literature
215 Canadian Regional Literature
313 Canadian Literature to 1920
314 Canadian Poetry Since 1920
315 Canadian Prose Since 1920
316 Canadian Drama
415 Major Canadian Writers
495A/B Senior Honours Essay Canadian Literature Option

Environment and Resource Studies (ERS)
218 Introduction to Canadian Energy Issues
241 Introduction to Environmental and Social Impact Assessment
318 Soft Energy Paths in Canada
337 Environmental Impact Assessment
338 Social Impact Assessment
351 Organization and Environmental Management: 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

French (FR)
151 Basic French (For students who have no background in French)
152 Basic French (For students who have no background in French)
155 Intensive Review of French (For students with Grade 12 French)
192 French Language (For students with Grade 13 French)
193 French for Bilingual Students I
195 French Literature 1
196 French Literature 2
205 Spoken French
206 Spoken French
207 Spoken French
208 Spoken French
251 Intensive Language Training
252 Français Pratique
273 Aspects du Québec
275 Contemporary French-Canadian Novel
293 French for Bilingual Students II
301/ Advanced Instruction in Written French
302
371 French-Canadian Poetry
372 Contemporary French-Canadian Theatre
401 Advanced Language Study
402 Advanced Language Study
471 French-Canadian Poetry

Geography (GEOG)
251 Cities in Canada
300 Geomorphology and the Southern Ontario Environment
309 Physical Climatology
322 Geographical Study of Canada
341 Historical Geography of Canada 1
342 Historical Geography of Canada 2
352 The Rural-Urban Fringe
422 Canada
461 Land Dereliction and Rehabilitation I

History (HIST)
102C Origins of War in the 20th Century
102E Canadian History
201X Canadian Urban History
203X Modern Quebec
204X Life on the Ontario Frontier
205X Canadian Business History
206X History of Canadian Minorities
207X Canadian Labour History
209 Health, Disease and Medicine in Canadian History 1500-1984

Interdisciplinary Options

Canadian Studies

417 Land Use History and Landscape Change 1
418 Land Use History and Landscape Change 2
433 People in Natural Areas

417 Land Use History and Landscape Change 1
418 Land Use History and Landscape Change 2
433 People in Natural Areas
<table>
<thead>
<tr>
<th>Page</th>
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<tbody>
<tr>
<td>215</td>
<td>The Proper Sphere: Canadian Women in Historical Perspective</td>
</tr>
<tr>
<td>223</td>
<td>Canadian Culture and Society to 1900</td>
</tr>
<tr>
<td>224</td>
<td>Canadian Culture and Society in the Twentieth Century</td>
</tr>
<tr>
<td>234</td>
<td>The Catholic Church in Canada since Confederation</td>
</tr>
<tr>
<td>245</td>
<td>Religious and Cultural Minorities in Canada</td>
</tr>
<tr>
<td>248</td>
<td>History of Canadian-American Relations to 1914</td>
</tr>
<tr>
<td>253X</td>
<td>Canadian History: 1760-1900</td>
</tr>
<tr>
<td>254X</td>
<td>Canadian History: 1900-1979</td>
</tr>
<tr>
<td>319</td>
<td>French-Canadian History</td>
</tr>
<tr>
<td>320</td>
<td>Modern Quebec History</td>
</tr>
<tr>
<td>322</td>
<td>History of Canadian-American Relations Since 1914</td>
</tr>
<tr>
<td>325</td>
<td>History of Canadian Indians to 1870's</td>
</tr>
<tr>
<td>326</td>
<td>History of Canadian Indians since 1870's</td>
</tr>
<tr>
<td>385</td>
<td>Canada From MacDonald to Laurier</td>
</tr>
<tr>
<td>386</td>
<td>Ontario History to Confederation</td>
</tr>
<tr>
<td>387</td>
<td>Ontario History Since Confederation</td>
</tr>
<tr>
<td>389</td>
<td>Canada in World Affairs: From Laurier to Trudeau</td>
</tr>
<tr>
<td>403X</td>
<td>Senior Seminar: Canadian History</td>
</tr>
</tbody>
</table>

**Political Science (P SCI)**

| 101M | Introduction to Public Policy                                                                 |
| 102M | Contemporary Issues in Canadian Public Policy                                                  |
| 231  | Government and Business in Canada                                                             |
| 260A/| Canadian Government and Politics 1/2                                                           |
| 291  | The Canadian Legal Process                                                                     |
| 292  | Issues in Canadian Criminal Law                                                                |
| 311  | 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  | Comparative Federal Systems                                                                    |
| 352  | Comparative Legislative 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                                                                 |
| 473  | Voting Behaviour                                                                               |
| 475  | Political Socialization                                                                        |
| 476  | Research Seminar in Political Behaviour                                                         |
### Interdisciplinary Options

#### Gerontology

#### 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 Certificate 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 Certificate 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 or 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 Certificate 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 aging phenomena.

The program of study for the Minor and for the Certificate 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 Gerontology 402 and 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** The Biology of Aging
- **GERON 400** Multidisciplinary Seminar on Aging
- **GERON 402**
- **MTHEL 402B** Epidemiology of Aging
Interdisciplinary Options  
Gerontology  
Iberoamerican Studies

HKLS: B.D. McPherson, Kinesiology  
BMH 1114 (ext. 3950)

Church Colleges:  
P. Naus  
St. Jerome's College  
STJ 114 (ext. 6593)

Optometry:  
M.E. Woodruff  
School of Optometry  
OPT 339 (ext. 3175)

Iberoamerican Studies

Assistant Professor, Director of Iberoamerican Studies  
J.A. Teichman, BA, MA, PhD (Toronto)

Members of the Iberoamerican Studies Advisory Committee

Assistant Professors  
J.E. Cuenca, LIC (Madrid), MA (Western Michigan), PhD (Toronto)  
J.A. Teichman, BA, MA, PhD (Toronto)  
B. Thalman, BA (DePauw), MA, PhD (Ohio State)

The Iberoamerican Studies Option is an Interdisciplinary program designed for students in any faculty of the University who have an interest in the Spanish- and Portuguese-speaking world, both in Latin America and in the mother countries, Spain and Portugal. 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 Iberoamerican 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 Iberoamerican Studies Option indicated on the diploma, students must have an overall average of 65% in the Iberoamerican Studies Option courses.

Courses

- P SCI 102F Politics in the Third World
- P SCI 350A Politics of the Developing Areas 1
- P SCI 350B Politics of the Developing Areas 2
- P SCI 453 Comparative Politics of Latin America  
/651
- P SCI 454 Comparative Politics II  
/652
- SPAN 217 Spanish American Civilization 1
- SPAN 218 Spanish American Civilization 2
Legal Studies

The Legal Studies Committee

Associate Professor, Director
M.F. McDonald, BA (Toronto), MA, PhD (Pittsburgh)

Professor
D.W. Hoffman, BSA, MSA (Toronto), PhD (Waterloo), PAg, MCIP

Associate Professors
C.G. Brunk, BA (Wheaton), MA, PhD (Northwestern)
D. Estrin, BA, LLB (Alberta)
R.C. Prus, BA (Manitoba), MA, PhD (Iowa)
F.G. Reynolds, BSc, MSc, (Manitoba), FSA, FCIA, MAAA
J.A. Wahl, CR, BA (Western Ontario), MA, PhD (St. Louis) J

Assistant Professor
R.P. Woolstencroft, BA, PhD (Alberta)

Lecturer
S.P. Gunz, BA, LLB (Sydney), MBA (Manchester)

Legal Studies is an Interdisciplinary Option that focuses 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 Sciences, History, Philosophy, Political Science, Sociology, Economics, and Environmental Studies. Students are invited to join in 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.

Interdisciplinary Options
Legal Studies

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.

The Legal Studies Option is open to students in General or Honours programs. Students must complete five year-course equivalents of designated Legal Studies courses from the appropriate sections. An overall average of 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:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIST 210X</td>
<td>History of Law, 0.5</td>
</tr>
<tr>
<td>PHIL 327A</td>
<td>Philosophy of Law - Part 1, 0.5</td>
</tr>
<tr>
<td>P SCI 292</td>
<td>Aspects of Canadian Law, 0.5</td>
</tr>
<tr>
<td>SOC 370G</td>
<td>Sociology of Law, 0.5</td>
</tr>
<tr>
<td>Total credits in Section 1: 2.0.</td>
<td></td>
</tr>
</tbody>
</table>

Section 2
Students are required to complete successfully two year-course equivalents from the following courses. Students in the Faculty of Environmental Studies must take ENV S 201, 401, and 402 plus one other course in Section 2.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACC 231</td>
<td>Business Law, 0.5</td>
</tr>
<tr>
<td>ACTSC 458</td>
<td>Insurance Law, 0.5</td>
</tr>
<tr>
<td>ENV S 201</td>
<td>Introduction to Environmental &amp; Planning Law, 0.5</td>
</tr>
<tr>
<td>ENV S 401</td>
<td>Environmental Law, 0.5</td>
</tr>
<tr>
<td>ENV S 402</td>
<td>Planning Law, 0.5</td>
</tr>
<tr>
<td>HIST 102M</td>
<td>Law and Society in the Middle Ages: 500-1400, 0.5</td>
</tr>
<tr>
<td>HIST 329</td>
<td>The History of Anglo-American Law, 0.5</td>
</tr>
<tr>
<td>ISS 350E</td>
<td>Family Law and Social Work, 0.5</td>
</tr>
<tr>
<td>PHIL 327B</td>
<td>Philosophy of Law - Part 2, 0.5</td>
</tr>
<tr>
<td>P SCI 291</td>
<td>The Canadian Legal Process, 0.5</td>
</tr>
<tr>
<td>P SCI 333</td>
<td>Administrative Law (in 1980/81 offered as P SCI 392), 0.5</td>
</tr>
</tbody>
</table>
Management Studies

Management Studies is a Minor program that can be taken in conjunction with many existing Honours Majors. The course is designed to provide a vehicle which allows a student who has pursued an Honours Major in a theoretical or specialized academic discipline, to focus such a background by completing a series of courses in those academic disciplines which provide the theoretical background for much of current management practice.

Management and management decision making have become much more complex in the past two decades with decisions needing to be based more on research and knowledge rather than intuition and experience. In order to gain maximum advantage of courses in the Management Studies program, it is necessary for students to have skills in algebra and calculus.

Management Studies provides a background which would be useful in many entry level management jobs, and offers a basis for further education in management.

Management studies should be of particular interest to students who see their future in tasks involving problem solving, the design of systems, or operations analysis.

Middle East Studies

Director of Middle East Studies
Daniel J. Sahas, BA (Athens), STM (Indianapolis), PhD (Hartford)

(Participating Faculty members are listed in Chapter 16).

The Middle East has played a vital role in the history of the world for millennia. Its past and present civilizations, languages, religions, cultures and scientific accomplishments have penetrated and become integral parts of Western civilization and culture. The Middle East continues to be a significant factor in world events today. For these reasons, the study of the Middle East remains an important and valuable academic activity.

This Middle East Studies Option provides, in an organized way, a listing of all courses with Middle East content.
Students will normally enter the program in their second year, although appropriate courses taken during year one 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. Eight term courses are required for this option. They are to be distributed as follows:
   a) At least seven term course equivalents from the approved list described below taken from at least three different disciplines.
   b) Middle East Studies 302
Other courses, which are not listed below, may be acceptable under special circumstances. Students should consult with the Middle East Studies Director before preregistering to check whether a particular unlisted course is acceptable in the Middle East Studies Option.
3. To meet the graduation requirements a student must maintain a minimum of 65% average overall in the Option.

Required Middle East Studies Course
MES 302 Directed Studies in the Middle East

Approved List of Middle East Studies Courses
CLAS 101 Colossus - the Major Figures of Ancient Greece
CLAS 201 Ancient Greek Society
CLAS 202 Ancient Roman Society
CLAS 251 Greek History
CLAS 252 Roman History
CLAS 292 Social Problems in Antiquity
CLAS 301 Ancient Myth and Religion I
CLAS 302 Ancient Myth and Religion II
ENGL 202A The Bible and Literature 1
ENGL 202B The Bible and Literature 2
FINE 110 Introduction to World Art I
FINE 218 Western Religious Art
GRK 372 Herodotus
HIST 210X History of Law
HIST 237 Ancient Civilization I
R S 100B Religions of the West
R S 100E Biblical Studies I
R S 100F Biblical Studies 2
R S 203 Wisdom Literature in the Old Testament
R S 205 The Hebrew Prophets
R S 206 Modern Study of Jesus

Middle East Content Courses
Note: The following courses have some Middle East content; however, they may NOT, at present, fulfill the requirements of the Middle East Studies Option. They are listed here as an additional resource for students interested in the Middle East.

ANTH 224 Prehistoric Archaeology: Old World II
ANTH 321 Recent Prehistory in the Old World
CLAS 371 Christianity and the Roman Empire I
GRK 100A Introductory Ancient Greek I
GRK 231 Intermediate Greek
R S 106A New Testament Greek I
R S 106B New Testament Greek II
R S 261 Women and the Great Religions
R S 305A/B Intermediate New Testament Greek

Peace and Conflict Studies
(Participating Faculty members are listed in Chapter 16.)

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. 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. The PACS Option 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 History, Man-Environment Studies, Philosophy, Political Science, Psychology, Religious Studies, Social Development Studies, and Sociology.

Program Options
There are three different Options open to students participating in the PACS program: 1) General Program, 2) Honours, and 3) Minor. 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 fully in Chapter 16) as well as a specified number of "PACS Content Courses" (listed below) offered by their own and other departments. In every case students must fulfill all the requirements for the major in their own department.

1. The General Arts Degree (Peace and Conflict Studies)
In addition to fulfilling the requirements for the major (normally including at least ten term courses in the major field), the general arts student must meet the following PACS requirements:

a) PACS 201, 202, 301, and 302.
b) six term courses chosen from the PACS Content Courses offered by either the department in which the student majors, or any other departments (see below).

The General Arts degree Option in Peace and Conflict Studies is available to those majoring in any department in the Faculty of Arts, including non-participating Departments.

2. Honours Program (Peace and Conflict Studies)
Students may choose straight or joint honours in any of the participating departments. Students are granted, upon completion of a 44 term-course program (46 term courses if joint honours), 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, 498, 499. (The PACS 498 requirement may be met by the successful completion of any Honours Research Course 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). 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 the PACS Content Courses offered in any department. (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.

Peace and Conflict Studies Content Courses Offered by Participating Departments
The following PACS-related courses are offered by the participating departments 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. Please consult the PACS undergraduate officer for more information. Full course descriptions are found in Chapter 16.

Environment and Resource Studies
ERS 231 Environmental Issues in Global Perspective
ERS 241 Social Change
ERS 337 Environmental Impact Assessment
ERS 338 Social Impact Assessment
ERS 361 Contemporary Media of Communication
ERS 400 Senior Honours Seminar in Environmental Management
ENV S 401 Environmental Law

History
HIST 102C The Origins of Wars in the 20th Century
HIST 102D From Nationalism to Totalitarianism
HIST 102E Canada and War in the 20th Century
HIST 102K Conflict in the Caribbean and Central America
HIST 208 The Cold War: American-Russian Relations Since November, 1917
HIST 217 Irish History: The Nineteenth and Twentieth Century
HIST 225 History of Modern Revolutions
HIST 230 Church and State in Modern Latin America
HIST 232 Revolutions in Latin America
HIST 348 Radical Reformation
Interdisciplinary Options

Peace and Conflict Studies
Personnel and Administrative Studies

Interdisciplinary PACS
PACS 230 The Politics of Nonviolence
PACS 250 The Nuclear Crisis
PACS 271 Introduction to Peace Research 1
PACS 272 Introduction to Peace Research 2
PACS 350 Canada and the Nuclear Crisis
PACS 398/399 Directed Readings in Peace and Conflict Studies

Philosophy
PHIL 216 Rational Behaviour and Decision-Making
PHIL 225 Social and Political Philosophy: Canadian Problems
PHIL 243 Conflict, Contract and Choice
PHIL 327A Philosophy of Law 1
PHIL 327B Philosophy of Law 2
PHIL 329 War, Peace, and Justice
PHIL 422 Political Philosophy 1
PHIL 423 Political Philosophy 2

Political Science
P SCI 101A Introduction to Politics
P SCI 102A Imperialism and International Relations
P SCI 102K Mass Political Violence
P SCI 225 Political Theory 1
P SCI 226 Political Theory 2
P SCI 281 International Politics I
P SCI 282 Foreign Policy
P SCI 321 Marxist Theory
P SCI 322 Marxism and Revolution after Marx
P SCI 350A Politics of Developing Areas 1
P SCI 350B Politics of Developing Areas 2
P SCI 380A World Politics 1
P SCI 380B World Politics 2
P SCI 479 Violence in the Political Process
P SCI 481 Research Seminar on World Politics
P SCI 483 Power Politics and World Order Studies
P SCI 484 Contemporary Strategies: Theories and Policies
P SCI 486 Middle Powers and World Politics
P SCI 488 Arab-Israeli Conflict

Psychology
PSYCH 254 Interpersonal Relations
PSYCH 316 Moral Development
PSYCH 333 Industrial Psychology
PSYCH 353 Aggression and Social Conflict
PSYCH 354 Interpersonal Processes in Critical Situations

Religious Studies
RS 253 The Bible and Peace
RS 254 War and Peace in Christian Theology
RS 263 Justice, Peace and Development
RS 274 Religious Approaches to Personal Crises

Social Development Studies
PSYCH 221R Interpersonal Interaction
SOC 221R Master Trends in Modern Society
SOC 327R Minority Status in Canadian Society
SOC 326R Canadian Ethnic and Cultural Minorities

Sociology
SOC 214 Social Inequality
SOC 222 Juvenile Delinquency
SOC 236 Social Movements
SOC 255 Third World Development
SOC 256 Ethnic and Racial Relations
SOC 265 Political Sociology
SOC 326 Issues in Third-World Development
SOC 342 Sociology of Industrial Relations
SOC 364 Social Change
SOC 370 Sociology of Law

Recommended PACS-Related Courses
The courses below, offered by non-participating departments, are recommended as of special interest to PACS students.
SY DE 433 Conflict Analysis

Personnel and Administrative Studies

Personnel and Administrative Studies (PAS) is a Minor program that can be taken in conjunction with many existing Honours Majors. The program is designed to provide a broad interdisciplinary 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 administrative 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 toward their personal career development through pursuing a Personnel and Administrative Studies course. The PAS Minor may be combined with a co-operative program in order to obtain work experience in this field.

The program of study consists of 12 half-course credits that may be completed at any point in the four-year term, plus a course in statistics. Many honours programs require a statistics course, and these are acceptable.
The courses encompass several central themes. First, analytical techniques are stressed. These “functional” tools have become increasingly important in administrative and business settings. Second, there is a strong emphasis on human resources. This focus is provided by courses in Political Science, Psychology, Management Science and Sociology. The third content area is concerned with the application of economic theory to the administrative role. Finally, there are two “core” courses in Personnel Administration. Students are encouraged to enrol in these courses in their second and third years of study. The two courses have a practical orientation and provide an integrative perspective on the topic area.

Program

A. Analytical Techniques
- Computer Science: CS 100 or 102.
- Statistics: MTHEL 102 or equivalent course within the student’s Honours program.
- Accounting: ACC 121.

B. Human Resources
- Public Administration: PSCI 331, 332
- Personnel and Industrial Psychology: PSYCH 339, and PSYCH 333 or MSCI 211.
- Industrial Sociology: SOC 242 or MSCI 311.

C. Economic Factors
- Microeconomics: ECON 101
- Management: ACC 131, 132.

D. PAS Core Courses
- Personnel Administration: PAS 200
- Issues in Personnel Administration: PAS 300

More information on this program is available from the Course Director, E.S. Lucy, at ext. 4551.

Society, Technology and Values

Rapid development of new technologies, in communications, bio-technology, robotics, and so on, has been matched in recent years by burgeoning research and public discussion focusing on the human context of science and technology. Of special concern are the changes to Canadian life that accompany implementation of these new technologies. The STV Option provides an opportunity to explore the wide range of social and personal issues associated with technological advances.

The STV Option consists of six courses. Three of these (STV 100, STV 200, and STV 400) are core courses required of all students enrolled in the Option. The remaining three are chosen from a list of courses which are grouped as “packages” that relate to the STV theme. Normally, students choose their three courses from one package but, with permission of the Program Board, the three courses may be chosen from more than one package. These courses are normally taken after having completed STV 100.

The following are illustrative themes that guide selection of the courses for the various packages:

Values and Ethics
- Technological Issues in War and Peace
- History of Technology
- Impact Assessment Studies
- Economic and Management Issues
- Technology and Artistic Expression

A sample package in Values and Ethics might include three of the following courses:

- GEN E 351 Information Technology and Society
- GEN E 412 Ethics and the Engineering Profession
- ERS 380 Technology/Lifestyles for a Conserver Society
- PHIL 205 Science, Technology and Society
- PHIL 215 Professional and Business Ethics
- PHIL 216 Rational Behaviour and Decision Making
- RS 260 Issues in Science, Technology and Religion
- SCI 263 Interactions of Science and Society
- SOC 232 Technology and Social Change

Responsibility for identifying the courses in each package (the courses that address the above-mentioned themes) rests with the Program Board. Selection of the courses is made in consultation with students who enrol in STV 100 and who have registered for the STV Option. This permits ensuring that the selected courses are actually being offered during the terms when they are required and also that the program requirements are responsive to the special needs and backgrounds of individual students.

The STV Option is open to undergraduate students in all Faculties of the University. It is administered by the Centre for Society, Technology and Values.

Course Requirements

Core courses (all three are to be completed)
- STV 100 Society, Technology and Values: An Introduction
- STV 200 Society, Technology and Values: Projects Course
- STV 400 Society, Technology and Values: A Senior Project

Optional courses (three courses from one of the theme packages, as indicated above).

For additional information, please write or call:
Ann Dunnet, Administrative Assistant
Centre for Society, Technology and Values
Room 301, E.S.1
Extension 6215
**Interdisciplinary Options**
Studies in Personality and Religion

**Program Board**
L. Haworth (Director of CSTV)
G. Atkinson, Faculty of Science
R. Cohen, Faculty of Mathematics
J. Goyder, Faculty of Arts
R. Legge, St. Paul's College
S. Lerner, Faculty of Environmental Studies (Convenor)
S. Smith, Faculty of Human Kinetics and Leisure Studies
B. Wills, Faculty of Engineering
R. Gibson, Faculty of Environmental Studies
J. Hepburn, Faculty of Science
J. Shea, Faculty of Engineering
F. Tompu, UWUTCIT

**Studies in Personality and Religion (SIPAR)**

*Chairman & Director of the Program*
R.D. Legge, BA (Transylvania), STB (Harvard), PhD (McMaster)

**Members of the SIPAR Advisory Committee**

*Professors*
H.J. Fallding, BA, BSc, MA (Sydney), PhD (Australian National), FRCS
J.R. Horne, BA, MA (Western Ontario), RTh (Huron) PhD (Columbia)

*Associate Professors*
D.M. Amoroso, BA, MA (Toronto), PhD (Waterloo)
J.M. Cornell, BA, MS, PhD (Washington)
A.L. Evans, BA (Toronto), BD (Emmanuel), STM (McGill), DMin (Andover-Newton)
F.C. Gerard, MA (College St. Dominique, France), BD, STM (McGill), PhD (Hartford Seminar Foundation)

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 departments in the University of Waterloo – Philosophy, Psychology, Religious Studies and Sociology.

**The Core Course Curriculum**
The core courses provide an introduction to the field of Studies in Personality and Religion. These courses give the student 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* (ARTS 202P) provides an historical survey of theories on the relationship between personality and religion;
*Psychology of Religion* (RS 270) examines the variety of religious experience from a psychological point of view;
*Personality and Religion* (RS 271) examines personality theory and its relationship to religious development and growth;
*Seminar on Selected Topics in Personality and Religion* (ARTS 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 different options open to students participating in the SIPAR program. The first is open to students in a General program; the second, to students in an Honours program only.

1. **General Program**
A SIPAR Option may be earned by students in a General program majoring in one of the sponsoring disciplines. Courses are to include ARTS 202P, RS 270 and RS 271 plus three other SIPAR designated courses outside of the major field. The subtitle “Studies in Personality and Religion” would be designated on the degree. In every case, students must fulfill all the requirements for the Major in their own departments.

2. **Honours Minor in Personality and Religion**
A Minor in SIPAR is available to students pursuing an Honours degree in any faculty (including non-Arts faculties). This Minor 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, ARTS 202P, RS 270, RS 271, ARTS 302P.

**Note:**
Each of the participating departments has designated certain course offerings as Studies in Personality and Religion content courses. Many of the 300- and 400-level courses have specific prerequisites. Students planning to pursue studies in these upper-level courses should use their elective courses wisely to ensure that the prerequisites for these courses are met.
Core Courses

ARTS 202P 0.5
Psychology of Religion in Historical Perspective

R S 270 0.5
Psychology of Religion

R S 271 0.5
Personality and Religion

ARTS 302P 0.5
Seminar on Selected Topics in Personality and Religion

Courses Selected from Participating Departments

A further understanding of this subject may be developed through the study of selected courses offered by participating departments, which will either broaden the student’s comprehension of the field or permit a deeper understanding of some particular aspect of Studies in Personality and Religion.

The actual combination of courses selected by a student is subject to the approval of the SIPAR advisor.

Religious Studies

R S 274  Religious Approaches to Personal Crisis, 0.5
R S 275  Religion and Psychotherapy, 0.5
R S 370  Dream in Religious Experience, 0.5
R S 371  Religion and Self-Destructive Behaviour, 0.5

Psychology

PSYCH 101  Introductory Psychology, 0.5
PSYCH 211  Developmental Psychology, 0.5
PSYCH 214  Psychology of Adolescence, 0.5
PSYCH 231  Psychology of Religious Experience, 0.5
PSYCH 254  Interpersonal Relations, 0.5
PSYCH 258  Principles and Evolution of Psychoanalytic Thought, 0.5
PSYCH 334  Theories in Counselling Psychology, 0.5
PSYCH 355  Personality Theory, 0.5
PSYCH 357  Psychopathology, 0.5

Philosophy

PHIL 102C  Philosophy of Life, 0.5
PHIL 237  Introduction to Philosophy of Religion, 0.5
PHIL 201  Love, 0.5
PHIL 203  Philosophical Perspectives on Death, 0.5
PHIL 236  Magic, Mysticism and the Occult
PHIL 470  Phenomenology, 0.5

Interdisciplinary Options

Studies in Personality and Religion
Women’s Studies

Sociology

SOC 101  Introduction to Sociology, 0.5
SOC 102  Social Problems, 0.5
SOC 107  Social Structure and Character, 0.5
SOC 204  Sociology of Adolescence, 0.5
SOC 206  Gender Roles, 0.5
SOC 209  Family Origin and Personal Identity, 0.5
SOC 233  Social Psychology of Beliefs and Attitudes, 0.5
SOC 234  Social Psychology and Everyday Life, 0.5
SOC 247  Sociology of Death and Dying, 0.5
SOC 264  Sociology of Religion, 0.5

Social Development Studies

ISS 220R  Changing Concepts of Childhood

Women’s Studies

Director of Women’s Studies
Lindsay Dorney, B.A. (Louisville), M.A. (Louisville)

In the last 15 years women have been the focus of major research projects, particularly in the humanities and social sciences. Questions on topics such as social expectations for women, medical, philosophical and religious assumptions of female capacities, women’s self-perception, women’s biological role and vocational place have been raised, and the many answers have been intensely debated.

Because this relatively recent focus in research has become such an important component of contemporary scholarship, the University of Waterloo and Wilfrid Laurier University co-operate in the staffing and teaching of courses in this field of study. Students may take courses at either University to fulfill requirements for the Option. However, if a course at one institution is substantially the same as that at the other, credit will be allowed for only one of the two courses. All such courses are identified by an asterisk in the following list.

Students will normally enter the program in their second year, although appropriate courses taken during Year One can be applied to the Women’s Studies Option. To register in the Option, simply indicate “Women’s Studies Option” on the registration form. Before pre-registration each spring, students should consult with the Women’s Studies Director and with the Department involved to determine which courses will be available in the coming academic year.
**Interdisciplinary Options**  
**Women's Studies**

### Requirements

1. This Option may be taken in combination with any General or Honours program.
2. Ten term courses are required for this Option. They are to be distributed as follows:
   a) W S 200
   b) W S 300 (prerequisite: W S 200 or permission of the Director or Co-ordinator)
   c) At least three courses from the Core List of courses.
   d) At least five courses from the Approved List of Women's Studies courses. When a department offers a special topics course which is relevant to the Women's Studies program, it may be counted toward the Option. Students should consult the Director of Women's Studies before preregistering to ascertain what special topics courses will be offered and to ensure that they are meeting the requirements for the Option.
   e) In exceptional cases a course from the Approved List may be substituted for a Core Course with the permission of the University of Waterloo-Wilfrid Laurier University Committee on Women's Studies.
3. To meet the graduation requirements a student must have a minimum average of 65% in the ten courses in the Option.

### Women's Studies Core Courses

<table>
<thead>
<tr>
<th>University of Waterloo</th>
<th>Wilfrid Laurier University</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>English 108E (UW) or English 225 (WLU)</strong></td>
<td>Women in Literature</td>
</tr>
<tr>
<td><strong>History 248 (WLU)</strong></td>
<td>History of the Sexes</td>
</tr>
<tr>
<td><strong>Philosophy 202 (UW)</strong></td>
<td>Philosophy of Women</td>
</tr>
<tr>
<td><strong>Psychology 235 (UW)</strong></td>
<td>Scientific Perspectives on Gender &amp; Sex</td>
</tr>
<tr>
<td><strong>Sociology 233 (WLU)</strong></td>
<td>Sociology of Women</td>
</tr>
</tbody>
</table>

### Women's Studies Approved Courses

**University of Waterloo**

- Anthropology 350: Sex Roles in Anthropology
- Anthropology 404: Human Development in a Cross Cultural Perspective
- Classical Studies 292*: Social Problems in Antiquity (equivalent to WLU Classics 218)
- Economics 353: Population Economics
- English 108E*: Women in Literature (equivalent to WLU English 225)
- English 208E: Women Writers of the 20th Century
- French 491: French Women Writers
- History 202X: The Individual and the Family in History
- History 215: The Proper Sphere: Canadian Women in Historical Perspective

**Wilfrid Laurier University**

- Anthropology 317: Psychological Anthropology
- Classics 205: Greek and Roman Mythology
- Classics 218*: Women in Greece and Rome (equivalent to UW CLAS 292)
- English 225*: The Woman Writer: Theory and Practice (equivalent to UW English 108E)
- English 226: Women in Fiction
- Fine Arts 301A: History of Art - Women in Art
- Fine Arts 301E: History of Art - Women Artists
- History 248: History of the Sexes up to the Industrial Revolution
- History 249: History of the Sexes from the Industrial Revolution to the Present
- Philosophy 249: Consciousness and Gender
- Religion and Culture 103: Love and Its Myths
- Religion and Culture 104: Evil and Its Symbols
- Religion and Culture 346: Religion and the Crisis of Daily Life
- Religion and Culture 348: Dynamic Psychology of Religion
- Social Welfare 200: Canadian Social Welfare Programs
- Sociology 201: Sociology of the Family
- Sociology 206R: Contemporary Society: Comparative Canadian Family
Interdisciplinary Options
Women's Studies

Sociology 233  Sociology of Women
Sociology 234* Sociology of Sex Roles
  (equivalent to UW Sociology 206)

Special Topics  To be announced

Courses with an * have an equivalent course at the other university and are not available for credit to students who already have credit for that course.

Other Women's Studies Content Courses
(These courses are not available for credit toward the Women's Studies Option.)

BIOL 447  History of Biology
CLAS 201  Ancient Greek Society
CLAS 202  Ancient Roman Society
CS 492  The Social Implications of Computing
DANCE 110  Introduction to the World of 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
ENGL 415  Major Canadian Writers
ERS 241  Social Change
FINE 255R  Film as Social Criticism
FINE 316  Canadian Native Art
FR 273  Aspects of Quebec
HIST 213X  Modern Western Popular Culture
HIST 252X  Europe in the Nineteenth Century
HIST 254X  Canadian History: The National Period
ITAL 396  Special Topics/Directed Readings
P SCI 272  Political Behaviour 2
P SCI 344  The Politics of Local Government
P SCI 475  Political Socialization
PSYCH 214  Psychology of Adolescence
PSYCH 253  Social Psychology
PSYCH 311  Behaviour and Development of Human Infants
PSYCH 316  Moral Development
PSYCH 331  Individual Differences
PSYCH 364F  Sex, Evolution and Social Behaviour
PSYCH 370  Cross-Cultural Psychology
R S 256  Current Ethical Issues
SCI 252  Biology and Society
SCI 400A  The History of Science 1
SCI 400B  The History of Science 2
SOC 243  Occupational Sociology
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</th>
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</thead>
<tbody>
<tr>
<td>STAT 333</td>
<td>F,W,S</td>
<td>3C</td>
<td>0.5</td>
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</tbody>
</table>

Course Name — Applied Probability

Course Description


Additional information about course requirements

Prereq: STAT 230

Terminology

<table>
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<tr>
<th>Terms Offered</th>
<th>Type of instruction</th>
<th>Additional Information</th>
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<tr>
<td>F fall term</td>
<td>C lecture</td>
<td>prereq prerequisite*</td>
</tr>
<tr>
<td>S spring term</td>
<td>L laboratory</td>
<td>coreq corequisite*</td>
</tr>
<tr>
<td>W winter term</td>
<td>T tutorial</td>
<td>antireq antirequisite*</td>
</tr>
<tr>
<td>J summer, first half, July</td>
<td>S seminar</td>
<td>* Refer to Glossary of Terms (page 6) for details.</td>
</tr>
<tr>
<td>A summer, second half, August</td>
<td>D discussion</td>
<td></td>
</tr>
<tr>
<td>M summer, both terms, July, August</td>
<td>R reading course</td>
<td></td>
</tr>
<tr>
<td>wkshp</td>
<td>std</td>
<td></td>
</tr>
<tr>
<td>fldlab</td>
<td>field lab</td>
<td></td>
</tr>
<tr>
<td>P practicum</td>
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</tbody>
</table>

* 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.
## 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>Accounting</td>
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<td>Actuarial Science</td>
<td>ACTSC</td>
<td>Interdisciplinary Social Science</td>
<td>ISS</td>
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<td>Anthropology</td>
<td>ANTH</td>
<td>Italian</td>
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<td>Applied Math</td>
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<td>Classical Studies</td>
<td>CLAS</td>
<td>Peace and Conflict Studies</td>
<td>PACS</td>
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<td>Combinatorics &amp; Optimization</td>
<td>C&amp;O</td>
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<td>Computer Science</td>
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<td>Dance</td>
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<td>Physics</td>
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<td>Drama</td>
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<td>Planning, Urban and Regional</td>
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<td>DUTCH</td>
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<td>PMATH</td>
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<td>Religious Studies</td>
<td>RS</td>
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<td>Russian</td>
<td>RUSS</td>
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School of Accountancy

Professor, Chairman
J.R. Hanna, BComm (McMaster), MBA, PhD (Michigan), CA, FCA

Associate Professor, Associate Chairman, Undergraduate Officer
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Professor, Graduate Officer
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Associate Professor, Director, Professional Studies in Accounting
D.T. Carter, BComm, MBA (Windsor), CA

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W.R. Scott, BComm (Carleton), MBA, PhD (Chicago), CA, FCA
W.R. Thrsk, BA (British Columbia), MA, PhD (Yale)

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W.M. Lemon, BA (Western Ontario), MBA (Toronto), PhD (Texas at Austin), CA, FCA, CPA
J.B. Whitney, BA, MA (Western Ontario), PhD (Toronto)

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B.G. Gaber, BA (Wilfrid Laurier), MS, PhD (Wisconsin), CA
D.D. Kennedy, BMath (Waterloo), MBA (McMaster), MS (Cornell), CMA
E.F. Kirzner, BA, MBA (Toronto)
A. Macnaughton, BA (Wilfrid Laurier), PhD (British Columbia)
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R.T. Vachon, BComm (Ottawa), MBA, MAcc (Laval), CA

Lecturers
S.P. Gunz, BA, LLB, MA (Sydney), MBA (Manchester)
S.A. Schnore, BA (Western Ontario)

Adjunct Lecturers
D.A. Baker, BBA (Lakehead), CA
R.P. Bish, CA
A.H. Headlam, MBA (Wilfrid Laurier), FCA
M.R. Longworth, BBA (Western Ontario), CA
P.A. Lubka, BBA (Wilfrid Laurier), CMA
R.W. Thiesburger, BA (Wilfrid Laurier), CA

Faculty Members of Accounting holding cross appointments to:
1. Statistics
2. Management Sciences

Faculty Members holding cross appointments to Accounting from:
3. Economics
4. Statistics

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.

Mr. J.W. Adams, Consultant, Emco Limited
Mr. M. Baronian, Vice-President, Johnson & Johnson Baby Products
Mr. J.C. Barratt, Retired
Mr. S.S. Bergstein, Bergstein and Morson
Mr. J.T. Black, Chairman, The Molson Companies Limited
Mr. W.E. Bradford, Deputy-Chairman, Bank of Montreal
Mr. D.A. Brown, Executive Partner, Coopers & Lybrand
Mr. D.E. Carse, Vice-President of Finance, Allen-Bradley Canada Limited
Mr. M. Cheyne, Thomas Ernst & Whinney
Mr. G.E. Crompton, Executive Partner, Calgary Office, Clarkson Gordon
Mr. J.P. Duffy, Partner, Dunwoody & Company
Mr. K.M. Dye, Auditor General of Canada, Government of Canada
Mr. G.C. Fowler, Partner, Price Waterhouse
Mr. S.J. Gaston, Partner, Price Waterhouse
Mr. J.L. Goodfellow, Executive Partner, Touche Ross & Co.

Mr. R.G. Harris, Executive Partner, Deloitte Haskins + Sells
Mr. R.H. Healey, Partner, Thorn Ernst & Whinney
Mr. D.C. Higginbotham, Partner, Price Waterhouse
Mr. D.H. Houston, Consultant
Mr. K. Hurdie, Sole practitioner
Mr. H.W. Jasper, Partner, Clarkson Gordon
Mr. G.S. Knights, Vice-President, CP Communications
Mr. A. Lang, President and Chief Executive Officer, Ruff-Macdonald inc.
Mr. T.A. McCauley, Partner, Peat Marwick Mitchell & Co
Mr. W.D. McGregor, President, CAP Communications
Mr. J.A. Milburn, Partner, Clarkson Gordon
Mr. P.D. Mitchel, President, Johnson & Johnson Baby Products
Mr. R.T. Neville, Partner, Dunwoody & Company
Mr. J.F. Otten, Assistant Provincial Auditor
Mr. H.J. Parkraz, Executive Partner, Vancouver Office, Clarkson Gordon
Mr. M. Rayner, Comptroller General of Canada, Treasury Board
Mr. I.L. Rosen, Partner, Rosen, Ezrin, Ogus & Company
Ms. N.B. Shroff, Partner, Arthur Andersen & Company
Ms. E.B. Sims, General Manager and Vice President, Chicope Manufacturing Limited
Mr. J.W. Sinclair, President and Chief Executive Officer, Moore Corporation Limited
Mr. J.A. Stacey, Partner, Deloitte, Haskins + Sells
Mr. R.H. Stackleford, Vice-President, Mutual Life Assurance Company of Canada
Mr. T.R. Turnbull, Chairman, Thorne Ernst & Whinney
Mr. W.R. Walker, Senior Partner, Peat Marwick Mitchell & Co
Mr. C.D. Weyman, Partner, Peat Marwick Mitchell & Co
Course Descriptions

Introductory Notes

1. Accounting courses numbered 300 and higher, beginning in the fall 1987 term, will be 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 courses labelled ACC 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 281 and ACC 122 for credit.

ACC 101 F 3C,1T 0.5
Introductory Accounting 1
An introduction to the principles and practices underlying the historical-cost income determination model.
Restricted to students required by their program to take ACC 101. Students with no prior background in accounting should register in ACC 101, Division Suffix C.

ACC 121 F 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.

ACC 131/132 W,S,F 3C 0.5
Management 1/2
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 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, torts, agency, credit, and negotiable instruments.

ACC 281 F 3C 0.5
Introductory Managerial Accounting
An introduction to the principles and practices of managerial accounting.
Prereq: ACC 101 and second-year standing

ACC 291 F,W,S 3C,1T 0.5
Financial Accounting 1
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: ACC 281

ACC 351 F,W 3C 0.5
Auditing 1
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

ACC 371 F,W 3C 0.5
Managerial Finance 1
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 F,W,S 3C 0.5
Managerial Finance 2
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

ACC 381 F,W,S 3C 0.5
Managerial Accounting 1
The development and use of accounting information in performing the managerial functions of planning, controlling, and decision making. Emphasis is on analysis of costs rather than on the procedural aspects of costing systems.
Prereq: ACC 291 and a course in Statistics

ACC 382 F,S 3C 0.5
Managerial Accounting 2
Consideration of more complex topics in management planning and control. Emphasis is on cost accumulation systems, performance evaluations, control models and applications of quantitative methods to management accounting.
Prereq: ACC 381

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 0.5 
Communicating Accounting Information for Decision Making
This course runs over the winter and spring terms. 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 F 3C 0.5
Accounting Information Systems
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

ACC 443 W 3C 0.5
Creative Thinking, Problem Solving and Decision Making for Accountants
This course comprises three modules: problem solving; data organization, analysis and presentation; and decision support and expert systems. These modules are intended to promote diagnostic, evaluative and judgmental skills and to encourage self-directed learning.

Prereq: CS 100 or equivalent

ACC 451 S 3C 0.5
Auditing 2
An examination of the elements of audit strategy and their interrelationships, including financial assertions, types and sources of audit assurance, and types and strengths of evidence gathering procedures.

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 W 3C 0.5
Computer Control and Audit
The evaluation of controls in a computerized environment, the impact of the computer on the audit approach and the utilization of the computer in conducting audit testing are considered.

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.

This course is part of an integrated, professionally accredited sequence of courses open only to students by permission of the School of Accountancy.

ACC 461 F S 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.

This course is part of an integrated, professionally accredited sequence of courses open only to students by permission of the School of Accountancy.

ACC 462 W 3C 0.5
Taxation 2
A continuation of ACC 461.

Prereq: ACC 461

ACC 463 F 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 the 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

ACC 491 F S 3C 0.5
Financial Accounting 3
An advanced accounting course considering specific problems of accounting for the corporate entity, such as business combinations, intercorporate investments, consolidated financial statements, accounting for foreign operations and foreign currency transactions, segment reporting.

Prereq: ACC 392
Peans. Cultural ecology and cultural evolution will be stressed!

Lakes area from his arrival ca. 11,000 years ago to the coming of Europeans. Archaeology and ethnographic evidence concerning human adaptations over the past three million years are considered.

A student may not take both ANTH 102A and ANTH 102B for credit.

ANTH 103 F 3C 0.5
The Nature of Language
A general introduction to the scientific study of language. Lectures on the nature of human language as compared with animal communication, some of the basic methods of historical and descriptive linguistics, and the importance of language in culture and society.

ANTH 201 W 3C,1L 0.5
Principles of Archaeology
An introduction to the working assumptions, analytic approaches, and integrative and descriptive methods of archaeological anthropology.

ANTH 232 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 102A or ANTH 102B or permission of the instructor

ANTH 203 F 3C 0.5
North American Prehistory
This is a general introduction to North American Archaeology. The traditional cultural ecological approach is used.

ANTH 222 W 3C 0.5
Prehistoric Cultures of the Great Lakes Area - A Survey
A general survey of the archaeological evidence of prehistoric man in the Great Lakes area from his arrival ca. 11,000 years ago to the coming of the Europeans. Cultural ecology and cultural evolution will be stressed.

Honours Anthropology students should take ANTH 322.

ANTH 223 F 3C 0.5
Archaeology of Foodways: Gatherers and Hunters
The technology, social organization and ideology of prehistoric and historic peoples who subsist without domesticated plants or animals. Archaeology and ethnographic evidence concerning human adaptations over the past three million years are considered.

Prereq: ANTH 101

ANTH 228 W 3C 0.5
Peoples of the Pacific
A comparative ethnological survey of selected indigenous societies in the Pacific Region.

Prereq: ANTH 203 or consent of the instructor

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 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.

Prereq: ANTH 203 or consent of the instructor

ANTH 261 F 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: One of ANTH 102A or 102B, or PSY 101 or 102M, or SOC 101
ANTH 365 F 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 377 W 3C 0.5
Early Cultures in the New World
Prehistoric cultural systems in the Americas prior to the advent of horticulture are studied. The major emphasis is on North American Paleo-Indian cultural-ecological systems.
Prereq: ANTH 203 or 322, 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 391/393 F,W,S 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 404 F 3C 0.5
Human Development in a Cross-Cultural Perspective: Human Development, Aging and Death
A seminar on the current issues in the anthropology of aging. Among the topics to be covered: Life span and life expectancy; perceptions of the aging process; treatment of the aged; aging and gender; aging and death, as experience and process. Students will be responsible for class reports and a research project.
Prereq: ANTH 102A or 102B or permission of the instructor

ANTH 490A/R F,W 0.5/0.5
Honours Essay
Directed reading and research in a selected area of anthropology inquiry. A letter grade for ANTH 490A will be submitted only after the completion of ANTH 490B.

COURSES NOT OFFERED 1987-88

ANTH 102B Anthropology Through Science Fiction
ANTH 221 Prehistoric Archaeology: Old World I
ANTH 224 Archaeology and the Growth of Cultural Complexity
ANTH 233 Inuit and Eskimo Cultures
ANTH 270 Archaeological Method and Technique
ANTH 271 Archaeological Field Methods
ANTH 321 Recent Prehistory of the Old World
ANTH 350 Sex Roles in Anthropology
ANTH 370 Ethnographic Field Methods
ANTH 373 Archaeological Reporting
ANTH 420 Social and Cultural Change
ANTH 460 Human Adaptation and Evolution

School of Architecture

Associate Professor, Director
L.W. Richards, BArch (Miami, O.), MArch (Yale), OAIA, MRAIC

Assistant Professor, Associate Director
R.E. Haldenby, BSc, BArch (Waterloo), Recipient of the Distinguished Teacher Award

Assistant Professor, Undergraduate Officer
R. Slwka, Dip.Arch Assoc Arch (Huddersfield), MArch & UD (Washington), RIBA

Professors
L.A. Cummings, AB (Washington), AM (Missouri), PhD (Washington), Recipient of the OUCIFA (Ontario) Teaching Award
R.H. Sime, AA (Hons) Dip (London), RIBA, MRAIC
F.H. Watts, AA Dip (London), MLA (Harvard), MRAIC

Associate Professors
A. Banerji, BArch (Calcutta), MArch (North Dakota State)
M. Eilimu, National Diploma in Design (High Wycombe)
B.R. Hunt, AA Dip (London), RIBA, MRAIC
D.B. McIntyre, BArch (Toronto), MRAIC
R.M. Schuster, BS, MS (North Dakota State), PhD (Iowa State), PEng
F. Thompson, BArch, MArch (Toronto), MRAIC
R. Wiljer, BA (Waterloo), MA (Ottawa)

Adjunct Faculty
T.M. Boake, BSc, BArch (Waterloo), MArch (Toronto)
O. Dutt, BA (Punjab), BSc (London), MS (Wisconsin), PhD (Waterloo), PEng
R. Sliwka, BArch (Toronto)
L. Pignatti, BArch (Rome), MArch (Toronto)
D. McKay, BArch (Toronto)
T. Seebohm, BEng, MEng, PhD (McGill), MArch (Boston), OAA, PEng

Guest Critics and Lecturers in the School of Architecture January 1 - November 30, 1986
Rick Andrichetti
George Baird
Merc Barnese
Brian Boigon
James Brown
Frank Carter
Phil Carter
Lawrence Cazaly
John Circka
Andrew Clarke
Donald Cnuikshank
Leo De Sorcy
William Dendy
A.J. (Jack) Diamond
Adrian Dicatri
D’Arcy Fenton
Mary Jane Finlayson
Steven Fong
Andrew Fox
John Fraser
Natalie Green
Zaha Hadid
Peter Heywood
Margaret Ieshi
COURSES FOR BACHELOR OF ENVIRONMENTAL STUDIES (PRE-PROFESSIONAL ARCHITECTURE)

ARCH 112 F 3C, 2L 0.5
Mathematics in Architecture
The application of mathematics to architecture through such studies as analytical and constructive geometry, trigonometry, algebra, differential and integral calculus, functions and matrices.

ARCH 142 F 4C, 2L 1.0
Iconography 1: Conventions
Selected statements 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: Consent of instructor

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 works 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 2C, 2L 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.

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 17.1S, 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 192 F 17.1S, 14std, 1.5
Design Fundamentals and Studio
Reinforcement and development of the ARCH 192 program, with but emphasis upon the application of design method and practice to specific architectural problems.
Prereq: ARCH 192
ARCH 195 F 3C 0.5
Introduction to Architecture
The course provides an introduction to the discipline and profession of architecture, balancing investigations of contemporary theory and practice. The emphasis is on architecture as a building art, a social and communicative art and, most importantly, a fine art. In addition to the lectures there are visits to significant buildings.
Prereq: Environmental Studies students only and consent of instructor

ARCH 1213 F, W 3C, 3L 0.5
Introduction to Architectural Computer Graphics
This course provides an introduction to the use of computer graphics in architectural design. The lectures cover both practical applications such as Computer Aided Design which are in use now by practising architects and computer graphics applications which are still experimental. Hands-on exercises using three-dimensional modelling software form a major component of this course.
Prereq: CS 100, ARCH 192, 193 or consent of instructor

ARCH 224 S 2C, 2L 0.5
An Introduction to Landscape Design
An introduction to the design of landscape with emphasis upon the architectural attributes of plants and landforms.
Prereq: ARCH 192, 193, 292 or consent of instructor

ARCH 244 F 2C, 2L 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 "renaissance" 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 Reformation through the Enlightenment until the French Revolution and Hume's dehronement 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 by: developing a clear understanding of each participant's own creative thought processes; increasing his/her ability to consciously and deliberately 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 calculations; combined stresses, beams of different materials, compression members, Euler's formula.
Prereq: ARCH 163

ARCH 264 F 3C 0.5
Building Construction
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 introducing 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; 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, 1L 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, 11 std 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 community". Emphasis is placed on programming, analysis and solution evaluation. Problems of construction, servicing, and siting will be further explored. Field trip to a major urban area (1 week).
Prereq: ARCH 292

ARCH 313 W 3C, 3 std 0.5
Computer Aided Design  
Use of Computer Aided Design (CAD) systems for the preparation of presentation and working drawings in building design. Lecture topics include the data structure of drawings and details, their storage, transmission and sharing between large and small compatible, networked CAD systems. Design theory as it pertains to CAD is also covered.
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 structure of contemporary architectural theory.
Prereq: Consent of instructor

ARCH 348 W 2C, 2L 0.5
Romanticism and 20th Century: Sense of Periods and Styles  
Depiction of "modern" culture as one in which the notion of environmental order as the fulfillment of natural law is replaced by a notion of order as the creation of autonomous human 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 relationships between buildings and their urban and natural contexts are considered.
Prereq: Registration in ARCH 492 or consent of instructor

ARCH 349A/B/C S 4C, T 0.5
Topics in Cultural History  
Research into various topics including architectural history, theory, practice, and pedagogy but exploring the means of study (the human mind, the preceptors, the tools of searching, ordering of findings, ways of presentation of the results of reflection). Guest lecturers, field trips, and private consultants will diversify the common studies. Because the topics will shift, it is possible to enroll in the course more than once.
Prereq: Consent of instructor after an interview and inventory.
The letter designation allows this course to be taken more than once for credit.

ARCH 362 W 2C, 2L 0.5
Steel: Design, Structure and Construction  
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 282

ARCH 363 F 2C, 2L 0.5
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 282

ARCH 371 F 2C, 1wkshp 0.5
Designing and Building with Solar Energy  
Instruction in the basics of solar technology, including principles of climatic design, solar basics, efficient building layout design, solar systems design, heat loss/gain calculations, and simple computer simulation of the designed systems.
Prereq: Consent of instructor (ability to figure heat calculations, basic knowledge of solar building)

ARCH 372 F 2C, 2L 0.5
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 conserving 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 392 or consent of instructor

ARCH 373 F 2C, 2L 0.5
Building Services II  
A study of services in buildings, covering electrical distribution, vertical transportation, lighting and acoustics. The course also addresses exterior applications, site planning and district services, and a survey of urban infrastructures.
Coreq: ARCH 393 or consent of instructor

ARCH 374/375 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 384/385 F, W, R 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 particular term.
Prereq: Approval of (in house) UGAC

ARCH 382 W 4C, 17 std 2.0
Design Concepts and Studio  
Design of complex environments; the effect of legal and administrative controls on the design of process and form; the influence of mechanical, structural and industrial building components on design process and architectural form. Projects will involve co-ordination of the design task with other disciplines involved in such projects.
Prereq: ARCH 282
ARCH 363 F 3C,18std 2.0  
**Design Concepts and Studio**  
The analysis and exploration of relationships between physical, social, political and economic systems that influence the physical environment; techniques for defining the patterns of interaction and predicting the influence on physical form involving other disciplines; projects to explore the techniques and design with others at the city or community scale.  
Prereq:  ARCH 392

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**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. In it the influences 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 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 452 W,G 2C 0.5  
**Specifications**  
Architectural working drawings and specifications; bidding requirements; general conditions; general requirements trade divisions, reference and source material, assembly and reproduction; structural, mechanical and electrical consultants.  
Prereq: BES standing 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 particular 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 application of design and analysis techniques 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 existing 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**  
Architecture 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 independently by the student between the 4B and 5A terms and will be reviewed and assessed by the 5A studio instructor.  
Prereq: ARCH 493

ARCH 556 3 2C 0.5  
**Architectural Practice: The Profession**  
Discussion of the legal and ethical aspects of architectural practice in Canada and in Ontario in particular, contracts, bonds and insurance, mechanics’ liens, by-laws and regulations, architectural partnership. The legal background, client-architect relations, partial services, professional problems.  
Prereq: BES standing

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 particular term.  
Prereq: Approval of (in house) UGAC

ARCH 592/593 W,S 3C 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 1987-88**

ARCH 194 Visual Interdisciplinary Language  
ARCH 212 Computer Science Simulation  
ARCH 223 Human Ecology: Social Behaviour as the Human/Physical Interface  
ARCH 265 Structural Morphogenesis  
ARCH 282 Preservation Practice-Background  
ARCH 283 Preservation Practice-Technology and Technique
Course Descriptions

Arts

Professor
P.H. Smith, Jr., BA (Harvard), PhD (Pennsylvania)

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 the interdisciplinary perspective in view.

2. Arts courses are elective courses in General Honours programs and, except for Arts 100A/100B, do not satisfy either the Group A or Group B requirements.

Arts 100A/100B F,W 3C 0.5/0.5
Introduction to the Humanities A and B
An interdisciplinary introduction to the arts, literature, philosophies and religions of Western Civilization, enabling the student to experience and discuss important representational works and ideas from selected periods, and to become acquainted with the humanistic disciplines. 100A focuses on selected periods from Classical Antiquity to roughly 1750. 100B focuses on selected periods from roughly 1750 to the present.

Arts 122 F 2C,1D 0.5
Quest for Meaning in the 20th Century
This course invites students to a quest for personal and corporate meaning in the context of a century in which traditional meaning definitions have been challenged by world wars, nuclear threat and rapidly shifting sexual, social, economic and religious values.

Offered by Conrad Grebel College.

Arts 198 F,W 0.5
Introduction to Computer Technology
A general introduction to the fundamental ideas of computers. Topics treated will include the use of an interactive computing system, word processing, and the beginnings of program writing. The course will examine the history of computing, and will consider the social and economic impact of the use of computers. No previous knowledge of computing is assumed.

Arts 202P F 0.5
Psychology of Religion in Historical Perspective
A study of the Psychology of Religion in its historical perspective from the nineteenth century to the present day. Methods, techniques and practices of research that are applicable to the examination of religious experience will also be introduced.

Arts 211/212 F/F,W 0.5/0.5
Computing Techniques in Language and Literature
An introduction to non-mathematical computer programming, with special emphasis on the manipulation of language data. The programming language used will be PL/I. ARTS 211 will concentrate on gaining skill in computer programming. ARTS 212 will stress file management, advanced text formatting and the use of system program utilities. Applications will include word indexes, text concordances, methods of computer-aided text comparison.

Prereq: ARTS 211 presupposes ARTS 198 or equivalent; 212 presupposes 211 or permission of the instructor.

Arts 215A/B
Man in Crisis (Literary Views)
A critical study of such themes as freedom vs. happiness, nihilism, collectivism vs. individualism, old tablets vs. utopias, alienation, earthbound fragmentation vs. the transcendental in the artistic writings of Kafka, Brecht, Hesse, Nietzsche, Solzhenitsyn, Dostoevsky, Zamiatin, Camus, and others. Taught in English.

Arts 215A F 3C 0.5
Man in Crisis 1 (Literary Views)
A critical study of Dostoevsky's The Grand Inquisitor, Nietzsche's Thus Spake Zarathustra, Tolstoy's What Men Love By, and works by Aldous Huxley, Zamiatin, Turgeniev, and Andres. The two major themes are Utopia, the yearning for and the shape of perfectibility, and Nihilism, the denial and/or destruction of "Dirt Tablets" or "God is Dead".

Arts 215B W 3C 0.5
Man in Crisis 2 (Literary Views)
A critical study of Brecht's The Caucasian Chalk Circle, Kafka's The Metamorphosis, and works by Ibsen, Hesse, Dostoevsky, Tolstoy, and Solzhenitsyn. The two major themes are Nihilism (see above) and Aliation, the divided self in exile, or the inability to give and to accept love.

Arts 225 F 3C 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 film) during the past century.

Offered by Conrad Grebel College.

Arts 249A/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.

Arts 249 A F 3C 0.5
Introduction to Sexuality and Sex Education 1
A broad multidisciplinary overview of perspectives on human sexuality.

Arts 249B 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 the most relevant methods and programs will be discussed.

Arts 250A/B J,F,W 3C 1.0/0.5/0.5
Introduction to Marriage and the Family
A multidisciplinary examination of marriage and the family.

Offered at St. Jerome's College.

Arts 250A J,F 3C 0.5
Introduction to Marriage and the Family 1
A broad multidisciplinary overview of perspectives on marriage and the family.

Arts 250B J,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.
ARTS 300 W 1C,2D 0.5
Integrating Seminar
An interdisciplinary seminar assisting senior students in integrating their studies in the humanities, sciences, and technology, into a coherent world-view informed by moral, religious, and aesthetic values, in preparation for decision-making in personal, social and professional life.
Prereq: Third-year standing
Offered at Conrad Grebel College

ARTS 302P W 0.5
Seminar on Selected Topics in Personality and Religion

ARTS 310A/B F/W 0.5/0.5
The Relationship Between Society and the Individual
An interdisciplinary examination of the contributions of the humanities and social sciences have made to our understanding of a basic intellectual problem: the relationship between society and the individual. Specifically, the course will provide an opportunity to discover how different disciplinary approaches can be combined to increase our insight into that relationship.
Prereq: Students in third year or above, or consent of instructor.
Offered at St. Jerome's College

ARTS 350A/B A 0.5/0.5
Advanced Topics in Family Life Education: Marriage and the Family
An in-depth analysis of selected topics in marriage and family life, especially in their emotional aspects, including evaluation of family life education in school and community.
Prereq: ARTS 250A/B
Offered at St. Jerome's College

COURSES NOT OFFERED 1987-88

ARTS 349A/B Advanced Topics in Family Life Education: Sexuality and Sex Education

Department of Biology

Professor, Chairman of the Department
R.G.H. Dower, BSc, MSc (Queen's, Edmonton, Alta, PhD (Brown)), PhD (Western Ontario), MSc (Belfast, N.I., BSc (Alberta)), recipient of the Distinguished Teacher Award

Associate Professor, Associate Chairman of the Department
S.M. Smith, BSc, MSc (McMaster), PhD (McGill), recipient of the Distinguished Teacher Award

Professor, Associate Dean of Graduate Studies, Faculty of Science
W.B. Kendrick, BSc, PhD, DSc (Liverpool, FRSC)

Professor, Associate Dean for Computing, Faculty of Science
C.J. Mayfield, BSc, PhD (Liverpool)

Associate Professors, Graduate Officers
N.C. Bols, BSc (Simon Fraser), MSc (British Columbia, PhD (Toronto), MSc (City College, New York), MSc, PhD (Waterloo)

Associate Professors, Undergraduate Officers
P.E. Morrison, BSc, MSc (Western Ontario), PhD (McMaster), C.A. Peterson, BSc, MSc (Alberta), PhD (California, Davis)

Assistant Professor, Undergraduate Officers
D.G. Dixon, BSc (Sir George Williams), MSc (Concordia, PhD (Guelph), W.R. Hawthorn, BSc, MSc (McMaster), PhD (Western Ontario)

Professor Emeritus
H.B.N. Hynes, BSc, PhD, DSc (London), ARCS, FRSC

Professors
E.B. Dumbratt, BSc, MForestry, PhD (Georgia)
H.C. Dutline, BSc, PhD (Wales)
C.H. Fernando, BSc (Ceylon), DPhil (Oxford)
A.D. Harrison, BSc, MSc, BEd, PhD (Cape Town)
W.E. Inmiss, BSc, MSc (Agriculture, Toronto, MSc (Michigan State)
J. Kruuv, BSc, MSc (Waterloo), PhD (Western Ontario)
J.K. Morton, BSc, PhD (Durham, FLS)

Instructors
J.F. Brookfield, BSc, BEd, BSc, MSc (Dalhousie)
L. Pasternak, BA, MA (Toronto)
N.J. Scott, BSc, MBA (McMaster), MSc (Waterloo)
K.E. Trevor, BSc (Acadia), MSc (Waterloo)

Faculty Members of Biology holding cross appointments to:
Chemistry

Faculty Members holding cross appointments to Biology from:
Physics

Urban and Regional Planning
Course Descriptions

BIOL 111 F 2C 0.5
Introductory Biology 1
An introduction to basic concepts in biology, including aspects of genetics, evolution and plant biology.
Open to students other than those intending to major in Biology or to enter the School of Optometry.

BIOL 112 W 2C 0.5
Introductory Biology 2
An introduction to the basic principles of zoology and ecology with reference to man as a biological organism.
Open to students other than those intending to major in Biology or to enter the School of Optometry.

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.
BIOL 201 cannot be counted for credit toward a BSc (Kinesiology) degree.

BIOL 202 W 2C,3L 0.5
Embryology and Histology
Fundamental developmental processes in vertebrates, including man, the development of the early embryo; morphogenesis of tissues and the major organ systems. Structure of human cells and tissues at the light-microscope level; epithelia, connective, muscular and nervous tissues and the major organ systems.
Open to students other than those intending to major in Biology.

BIOL 210 F 2C,3L 0.5
Introductory Invertebrate Zoology
A study of the functional morphology of selected invertebrate types with special emphasis on the various grades of organization and development in the different phyla.

BIOL 211 W 2C,3L 0.5
Introductory Vertebrate Zoology
An introduction to the structure, evolution and development of vertebrate organ systems.
Offered during the Spring term in odd-numbered years.

BIOL 220 F 2C,3L 0.5
Plant Biology 1 - The Living Plant
An introduction to the structure, function and physiology of plants with emphasis on flowering plants.

BIOL 221 W 2C,3L 0.5
Plant Biology 2 - The Diversity of Plants
A comparative survey of the morphology and life histories of the different kinds of plants and fungi important to man and an introduction to their evolution.
Offered during the Spring term in odd-numbered years.

BIOL 222 F T 0.5
Non-Vascular Plants
An introductory course which will survey the evolution, morphology, ecology and importance to man of the fungi, algae, and bryophytes.
By correspondence only for 1987-88

BIOL 230 F 2C,3L 0.5
Introductory Cell Biology
An introduction to the concepts of cell biology with emphasis on (1) the structural organization of the cell and its constituent organelles and (2) the function of critical molecular processes that are characteristic of living organisms.

BIOL 233 W 2C,3L 0.5
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.

BIOL 239 W 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 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 250 is recommended for students specializing in ecology.

BIOL 298 F 0.25
Field Course 1
A series of one-day field trips from campus, usually the first six Saturdays of term, 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: A small charge for bus fare.

BIOL 301 A/B, F/W 2C,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 system, 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 311 W 2C,3L 0.5
Vertebrate Zoology
Major topics in vertebrate zoology as exemplified by both living and fossil members of the subphylum Chordata.
Prereq: BIOL 211

BIOL 315 W 2C,3L 0.5
Invertebrate Zoology
A survey of the major invertebrate phyla other than the arthropods, with emphasis on their functional anatomy, classification and ways of life.
Prereq: BIOL 211...
BIOL 316 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.

BIOL 323 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.

BIOL 324 F 2C,3L 0.5
The Flowering Plants
A study of floral morphology in relation to classification and evolution. An introduction to taxonomy and nomenclature. History of taxonomy. Systems of classification. Mechanisms of pollination and dispersal. Students entering this course are required to make a flowering plant collection. Instructions should be obtained from the Herbarium prior to the summer break.

BIOL 327 F 2S,3L 0.5
Mycology 1
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

BIOL 330 F.S 2C,3L 0.5
Molecular Biology
Molecular biological aspects of chromosome replication, expression of genetic information, functional translation of specific eukaryotic proteins, cell division, gene expression, embryogenesis, hormone action, cellular interactions and cell differentiation.

BIOL 331 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

BIOL 333 W 2C,3L 0.5
Histology and Cytoogy
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 233

BIOL 335 W 2C,3L 0.5
Plant Physiology
A study of the principal physiological mechanisms that govern the water economy, mineral nutrition, transport processes and metabolism of plants.

BIOL 336 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.

BIOL 337 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 338 W 2C,3L 0.5
Comparative Animal Physiology 2
A comparative study of the cardiovascular, nervous, muscular, respiratory and reproductive systems.
Prereq: BIOL 233

BIOL 342 F.S 2C,3L 0.5
Microbial Biotechnology
The role of microorganisms in biotechnology. Topics examined will include the isolation, selection, and development of microorganisms important in biotechnology, and specialized techniques for their cultivation and maintenance. Processes studied will include biomass conversions, fermentations, bioproduction of compounds, nitrogen fixation, treatment and utilization of wastes and mineral leaching.
Prereq: BIOL 240/241 or permission of instructor

BIOL 344 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 in the food industry is emphasized. Laboratory work will reflect current practices in quality control and testing.
Prereq: BIOL 240/241 or permission of instructor

BIOL 350 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 contaminants on ecosystems; biodegradation and cycling.

BIOL 356 W 2C,1T 0.5
Population Ecology 1
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.
Prereq: BIOL 250 and STAT 202

BIOL 416 F 2C,3L 0.5
Entomology
Introduction to morphology, systematics and biology of insects.
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 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 the instructor
Offered in even-numbered years.
BIOL 426 W 2C,3L 0.5
Phycology
The taxonomy and ecology of freshwater and marine algae. Algal cytology, morphology, and life histories; biology of planktonic and attached algae; culturing of algae, experimental phycology, economic aspects of algae.
Prereq: BIOL 220 or 221

BIOL 427 W 2C,3L 0.5
Mycology 2
The growth of mycological knowledge will be traced and current developments analyzed. Extensive literature surveys, active class participation, and a lab project will be required.
Prereq: BIOL 327

BIOL 431 W 2C,3L 0.5
Mammalian Reproductive Physiology
A study of the endocrine and reproductive systems of mammals. Major topics include methods of hormone assay, chemistry of the hormones, regulation of secretion, mechanisms of hormone action, neurosecretion, reproductive cycles, gametogenesis and fertilization.
Prereq: BIOL 327 recommended

BIOL 432 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.

BIOL 434 W 3C,5/S 0.5
Advanced Genetics
A detailed examination of the recent advances in molecular genetics with emphasis on the regulation of gene action in both prokaryotes and eukaryotes. Current research literature will be reviewed.
Offered every other year. Alternates with BIOL 436

BIOL 435 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.

BIOL 438 W 3C,5/S 0.5
Advanced Molecular Biology
An examination of the current major issues in molecular biology with emphasis on the technical and conceptual advances. Current research literature will be reviewed.
Prereq: BIOL 330
Offered every other year. Alternates with BIOL 437

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 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
Physiology
The nature of viruses and their interaction with their plant, microbial and animal hosts.
Prereq: BIOL 240/241

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 344

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, 441

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.
Prereq: BIOL 240/241, or permission of instructor

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.
Prereq: BIOL 240/241, 446, or permission of instructor

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.
Prereq: BIOL 240/241, or permission of instructor

BIOL 449 W 2C,3L 0.5
Microbial Physiology 2
A study of the physiology of microorganisms with emphasis on synthetic and assembly processes. Mechanism 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.
Prereq: BIOL 240/241 or permission of instructor

BIOL 450 F 2C,3S 0.5
Marine Biology
An examination of coastal and offshore marine environments. Physical and chemical oceanography, plankton, benthos and fish are discussed.
Prereq: BIOL 210; a marine field course
Antreq: SCI 453
Not offered in Fall 1986

BIOL 451 W 3C 0.5
Limnology
A study of the geomorphology, physical and chemical processes, and biology of lakes and streams. Ecology of zooplankton, zoobenthos, and fish are emphasized.
Prereq: BIOL 210, 250
Antreq: SCI 454

BIOL 452 F 2C,3S/fldlab 0.5
Fisheries Biology
The practices of fisheries biology: life history, age and growth, fecundity, production, harvest and management of fisheries resources.
BIO 455 F 2C,3L 0.5
Environmental Toxicology 2
Cellular, developmental and physiological effects of toxics on multicellular organisms.
Prereq: BIOL 350

BIO 456 W 2C,3flab/T 0.5
Population Ecology 2
The analysis of the structure and dynamics of plant and animal populations. Theoretical, mathematical and experimental approaches to the study of population ecology. Evolutionary processes in population biology.
Prereq: BIOL 356

BIO 457 F 2C,3flab/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.
Prereq: BIOL 250 and STAT 202

BIO 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. Prereq: STAT 202 or equivalent

BIO 473 W 3C/S 0.5
Bio-systematics and Evolution
A study of the processes of evolution; the differentiation of populations and the origin of new forms of life.
Prereq: BIOL 239

BIO 480 F 3C 0.5
Biotechnology 1
Genetic engineering entails the directed alteration of the hereditary apparatus of cells. How genetic material is manipulated (i.e., 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 240-241 and CHEM 237 or permission of the instructor

BIO 490 F.W.S flab/T 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-tidal benthos. Grade based on a field notebook and a research project. This course will normally be held at Huntsman Marine Lab, New Brunswick each September. Courses sponsored by Ontario Universities at other times of the year may also qualify.
Prereq: BIOL 210, 250 or equivalent Field trip fee: $400-$500

BIO 491 F.W.S flab 0.25
Field Course 2
A general interest field course usually of one week duration. Requirement is met by attending the first week only of a two-week trip arranged or approved by the Department (e.g. BIO 490 or 491). Courses sponsored by Ontario Universities at other times of the year may also qualify.
Coreq: BIOL 250 or equivalent Field trip fee: $100-$300

BIO 498 F,W,S flab 0.5
Senior Honours Project
A senior-year research project. Normally, only students attaining a 70% cumulative major average will be accepted into this course. Students are referred to the co-ordinator for BIOL 499 for further details.
A final grade for BIOL 499A will be submitted only after completion of 499B

Biological Sciences

Courses NOT OFFERED 1987-88
BIO 245 General Microbiology 1
BIO 246 General Microbiology 2
BIO 430 Comparative Animal Physiology 3
BIO 433 Stress Physiology and Aging in Plants
BIO 458 Quaternary Ecology

Canadian Studies

Associate Professor, Chairman of the Canadian Studies Program Board
K.M. Bennett, BA, MA (Queens), PhD (McGill)

Associate Professor, Director of the Program
S.E. McMillan, BA, MA (Carleton), PhD (Dalhousie)

Assistant Professor, Canadian Studies Program
P. Greenhill, BA (Trent), MA (Memorial), PhD (Texas)

Associate Professors, Members of the Program Board
T.S. Abler, BA (Northwestern), MS (Wisconsin-Milwaukee), PhD (Toronto)
F.C. Gerard, MA (College St. Dominque, France), BD, STM (McGill), PhD (Harvard), P
R.D. Legge, BA (Transylvania), STB (Harvard), PhD (McMaster)
W.L. Mitchinson, BA, MA, PhD (York)
E.R. Officer, BA (British Columbia), MA (Wisconsin)
G.E. Siethague, BA (Pacific Lutheran), MA, PhD (Nebraska)
P.G. Socken, BA (Toronto), MA (Iowa), PhD (Toronto)

Assistant Professors, Members of the Program Board
G.O. Michalenko, BA, PhD (Saskatchewan)
J.B. Theberge, BScA (Queen's), PhD (British Columbia)
R.P. Woolstencroft, BA, PhD (Alberta)
G.K. Warriner, BA (British Columbia), MA (Wisconsin), PhD (British Columbia)

Participating Faculty

Professors
R.R. Krueger, BA, MA (Western Ontario), PhD (Indiana)
N.L. Patterson, BA (Washington)
D.F. Walker, BSc (London), MA, PhD (Toronto)
J. Zuzanek, CSc (Prague Institute of Sociology), PhD (Charles University, Prague)

Associate Professors
T.S. Abler, BA (Northwestern), MS (Wisconsin-Milwaukee), PhD (Toronto)
M.S. Bird, BA, MA, PhD (Iowa), R
M.F. McDonald, BA (Toronto), MA, PhD (Pittsburgh)
K.M. McLaughlin, BA (Waterloo), MA (Dalhousie), PhD (Toronto)
**Course Descriptions**

**Canadian Studies**

**Chemical Engineering**

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**Department of Chemical Engineering**

Professor, Chairman of the Department  
E. Rhodes, BSc Tech, MSc Tech, PhD  
(Manchester), PEng

Professor, Associate Chairman (Graduate Studies)  
R.R. Hudgins, UE, BASc, MASC (Toronto), MA, PhD (Princeton)

Professor, Associate Chairman (Undergraduate Studies)  
C.M. Burns, BASc, MASC (Toronto), PhD  
(Polytechnic Institute, Brooklyn), PEng

Professors  
J.J. Byerley, BASc, MASC (Toronto), PhD  
(British Columbia)

K.S. Chang, BS (Hayang Institute Technology, Seoul), MSc, PhD (Northwestern)

F.A.L. Dullien, Dipl Ing (Budapest Technical University) MASC, PhD (British Columbia), PEng

T.Z. Fahidy, BSc, MSc (Queen’s), PhD  
(Illinois), PEng

G.I. Farquhar, 2 BASc (Waterloo), PhD  
(Wisconsin), PEng, Recipient of the Distinguished Teacher Award

R.Y-M. Huang, BASc (National Taiwan University), MASC, PhD (Toronto), PEng

M. Moo-Young, BSc (London), MASC  
(Toronto), PhD (London), PEng

K.F. D’Driscoll, 2 BChE (Pratt Institute),  
MA, PhD (Princeton)

D.C.T. Pei, BEng (McGill), MSc  
(Queen’s), PhD (McGill)

P.M. Reilly, 2 UE, BASc (Toronto), DIC, PhD (London), PEng, Recipient of the Distinguished Teacher Award

G.L. Hempel, 2 BSc, PhD (British Columbia)

C.W. Robinson, BASc (British Columbia),  
PhD (California-Berkeley)

A. Rudin, 2 BSc (Alberta), PhD (Northwestern), PEng

L.S. Scott, BASc, MSc (Alberta), PhD (Illinois), PEng

P.L. Silveston, BS, MS (MIT), Dr Ing  
(Munich), PEng

D.R. Sprnk, BS (Michigan), MS  
(Rochester), PhD (Iowa State), PEng

J.R. Wynnyckyj, BEng (McGill), MASC, PhD (Toronto)

Associate Professors  
L.E. Bodnar, DA, MA (Saskatchewan),  
PhD (McMaster)

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**Course Descriptions**

**Canadian Studies**

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**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.

**Social Regionalism**

Lecturers in Geography, Political Science, Sociology and History discuss the roles which economic disparities, social elites, federal/provincial relations and political parties play in defining Canadian regionalism. Particular attention is paid to Quebec’s desire for separate status.

**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.

**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.

**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.

**Research Essay**

An extensive senior research essay, supervised by a committee composed of faculty members from two or more of the participating departments, which deals with a specific aspect of Canada utilizing material and methods from several different disciplines.

A grade for CDN ST 400A/B is submitted only after the completion of CDN ST 400B.

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**Course Descriptions**

**Canadian Studies**

S.E. McMullin, BA, MA (Carleton), PhD  
(Dalhousie)

K.R. Stoffier, BA (Southern California),  
MA, PhD (Queen’s)

Assistant Professors  
S.D. Burt, BA, MA (Waterloo), PhD (York)

T.J. Downey, BA (Waterloo), MA, PhD  
(Western Ontario)

P. Greenhill, BA (Trent), MA (Memorial),  
PhD (Texas)

D.J. Horton, BA (Waterloo Lutheran), MA  
(Waterloo), PhD (McGill)

E. Kliman, MA, PhD (Toronto)

R.P. Woolstencroft, BA, PhD (Alberta)
Course Descriptions

Chemical Engineering

P.L. Douglas, BASc, MASC, PhD (Waterloo), PEng
K. Enns, BASc, LLB, MASC, PhD (Toronto)
J.D. Ford, BEng (McGill), MASC, PhD (Toronto), PEng
C.E. Gall, BASc (Toronto), MSc (Queen's), PhD (Wisconsin)
P.L. Douglas, BEng (Waterloo), PEng
G.R. Sullivan
J.M. Scharer, BSc (Pennsylvania)
I.F. Macdonald, BEng (NSTC), MASC, PhD

Assistant Professors
I. Chatzis, BASc, MASC, PhD (Waterloo) (DuPont-NSERC Assistant Professor)
D.A. Holden, BASc, MASC, PhD (Toronto), NSERC Research Fellow
R.L. Legge, BSc, PhD (Calgary), NSERC Research Fellow
A. Penidis, Dipl. Eng. (Thessaloniki), PhD (McMaster)

Faculty Members of Chemical Engineering holding cross appointments to:

Chemistry
Management Sciences
Statistics

Faculty Members holding cross appointments to Chemical Engineering from:

Chemistry
Civil Engineering

Course Descriptions

Introductory Note
Prerequisite: For all courses in the Department of Chemical Engineering, registration in the Department or permission of the Associate Chairman (Undergraduate Studies) is a requirement.

CH E 101 W.S 3C:1TL:2L 0.5 Chemical Engineering Concepts 2
An extension of the topics covered in CH E 100. Energy balances. Laboratory experiments illustrate the physical principles discussed.

CH E 102 F 3C:2T 0.5 Chemistry for Engineers
Chemical principles with applications in engineering. Stoichiometric calculations, properties of gases, properties of liquids and solutions, gas phase chemical equilibrium, ionic equilibrium in aqueous solutions, oxidation-reduction reactions, chemical kinetics.

CH E 021 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.

CH E 022 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.

CH E 023 F.W 3C:1T 0.5 Physical Chemistry 1

CH E 024 F.W 3C:1T 0.5 Physical Chemistry 2
Thermodynamics: ideal dilute solutions; equilibria in condensed phases and in non-ideal systems; activities and fugacities in non-ionic and ionic solutions.

Surface phenomena: surface tension; capillarity; adsorption; electrical double layers; colloids. Transport properties: deductions of values of thermal conductivity, viscosity and diffusion coefficients from dynamic theory. Chemical kinetics: rate laws; mechanisms; catalysis; theory of reaction rates; heterogeneous reactions; photochemistry; Polymers; types; thermodynamics of solutions.

CH E 026 S.F 3C:1T:3L 0.5 Physical Chemistry 3

Introductory Biotechnology

CH E 030 W.S 3C:1T 0.5 Transport Processes 3 (Heat Transfer)

CH E 031 W.S 3C:1T 0.5 Process Flowsheeting
Process simulation and mathematical modelling of chemical engineering flowsheets involving process units. Design variables; process simulation architectures; flowsheet decomposition theones. Use of modern computer-aided process design packages such as CHEMSHARE and SPEEDUP.

CH E 032 W.S 3C:2L 0.5 Introductory Biotechnology

Alternate weeks
Chemical Engineering

Thermodynamics
Thermodynamics applied to practical situations. Examples to be chosen from such topics as: fluid flow; simultaneous generation of heat and power; refrigeration; air conditioning and water cooling; liquefaction of gases; equilibria in complex chemical reactions; separation processes; surface phenomena; electrochemical reactions; plasma; global thermodynamics; biological processes; explosives; dust explosions.

Prereq: CH E 023 and CH E 026
Formerly CH E 330

Inorganic Process Principles 1
Inorganic chemical processes of industrial importance: sulphuric acid; nitric acid; ammonia; chlorine; phosphate; caustic; uranium. Principles and applications of atomic and molecular structure to inorganic processes; atomic theory; bonding; stereochemistry; catalysis, transition metal chemistry. Some thermodynamic aspects of inorganic chemistry: thermodynamics, stability of elements and compounds; graphical representation of thermodynamic data; aqueous solution thermodynamics. Inorganic materials: structure and properties of metals and alloys; ceramics; composites; semiconductors. Selected topics in biology, polymers, metallurgy.

1Alternate weeks
Formerly CH E 222

Transport Processes A (Mass Transfer)

Prereq: CH E 030
Formerly CH E 317

Chemical Reaction Engineering
Review of chemical kinetics. Single-phase (homogeneous) reactors: isothermal operation; batch; error propagation; steady state plug flow; CSTR; CSTR's in series; plug flow reactor with recycle; dynamic response of CSTR's; reactor networks. Temperature effects: adiabatic batch reactors, non-isothermal CSTR, multiplicity, non-isothermal tubular reactors; hot spot; parametric sensitivity; multistage reactors; adiabatic and non-adiabatic, cold shot cooling, optimum temperature profiles. Two-phase reactors: adsorption and heterogeneous catalysis; physiosorption and chemisorption; surface areas; catalytic surface; Langmuir isotherm; Hougton-Watson models; effectiveness factor. Multiple reactors. Fluidized beds.

Prereq: CH E 023 and CH E 026
Formerly CH E 331

Applied Mathematics 2 (Advanced Mathematics in Chemical Engineering)

Prereq: MATH 110A, MATH 110B, MATH 114, MATH 210, MATH 216 and CH E 022
Formerly CH E 330

Inorganic Process Principles 2

1Alternate weeks
Formerly CH E 332

Chemical Engineering Unit Operations Laboratory
Experimental applications of physical and chemical principles using pilot scale equipment. Experiments illustrating major unit operations: distillation, absorption, extraction, drying, humidification. Equipment design and materials of construction: design, sizing and selection of pumps, piping, valves, blowers and compressors.

Prereq: CH E 030
Formerly CH E 410

Economics for Chemical Engineering

Formerly CH E 382

Research-Design Project 1
Individual research or design on any chemical engineering subject chosen by the student in consultation with the supervising professor. An oral proposal presentation and a written interim report are required.

Prereq: CH E 043
Students enrolled in this course must take CH E 047 in 4B.

Research-Design Project 2
A continuation of CH E 042. The team design project started and presented in proposal form in 4A is completed. An oral presentation of results and a written report are required.

Prereq: CH E 047
Formerly CH E 48

Research-Design Project 3
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
Formerly CH E 581
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
Formerly CH E 517

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, waterflooding and enhanced oil recovery techniques.
Formerly CH E 502

CH E 522 W 3C 0.5
**Advanced Process Dynamics and Control**
Prereq: CH E 041
Formerly CH E 521

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
Formerly CH E 523

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
Formerly CH E 551

CH E 554 W 3C 0.5
**Extractive Metallurgy 2**
(Pyrosmelting)
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 to be placed on the interplay between the underlying thermodynamics, kinetics and transport processes in these heterogeneous reactions, and on the associated process engineering considerations.
Formerly CH E 553

CH E 562 W 3C 3L 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
Three experiments during term
Formerly CH E 561

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
Formerly CH E 563

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.
Formerly CH E 570

CH E 574 W 3C 0.5
**Treatment of Aqueous Inorganic Wastes**
A case-study based introduction to treatment of inorganic wastes from metallurgical processes and metals working/finishing operations. Chemical treatment; ion exchange; reverse osmosis; adsorption, electromembrane treatment; electrochemical treatment. Legal jurisdiction; economic and social implications.
Formerly CH E 571

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Department of Chemistry

Professor, Chairman of the Department
A.J. Carty, BSc, PhD (Nottingham), FCIC

Professor, Associate Chairman of the Department
R.G. Woolford, MSc (Western Ontario), PhD (Illinois), FCIC

Associate Professor, Advisor on Academic Human Resources to the Vice-President, Academic
D.A. Bribbin, BSc (Alberta), PhD (Toronto)

Associate Professor, Assistant Dean, Special Projects, Faculty of Science
R.J. Friesen, BSc, MSc (Manitoba)

Assistant Professor, Graduate Officer
D.A. Holden, BSc, LMus (McGill), MSc, PhD (Toronto)

Associate Professor, Undergraduate Officer
A.D. Maynes, MA, PhD (Toronto)

Professor, (University of Guelph) Director of the Guelph-Waterloo Centre for Graduate Work in Chemistry
R.J. Balahura, BSc (Waterloo), PhD (Alberta)

Professors Emeritus
W.A.E. McBryde, MA (Toronto), PhD (Virginia), FCIC
W.B. Pearson, DFC, MA, DSc (Oxford), FRSC, FCIC

Professors
G.E. Mackay, J.L. Koppel, P.C. Chleh, WSc (Nat. Taiwan), MSc (Nat. J.B. Capindale, W.L. Elsdon, MSc
G.F. Atkinson, Associate Professors
L.J. Brubacher, T. Viswanatha, MSc, MSc (McMaster), PhD (Chicago), FCIC
A. Rudin, BSc (Acadia), MSc, PhD (McMaster)
F.W. Karasek, BS (Emihurst), PhD (Oregon State), FCIC
R.J. LeRoy, BSc, MSc (Toronto), PhD (Wisconsin)
F.R. McCourt, RSc, PhD (Rushish Columbia)
H.G. McLeod, MA, PhD (Toronto), (Retired)*
T.B. McMahon, BSc (Western Ontario), MSc (McMaster), PhD (Chicago), FCIC
T.B. Marder, BSc (Massachusetts Institute of Technology), PhD (UCLA)
J.B. Moffat, BA, PhD (Toronto), FCIC
R.H. Marchesault, BSc (Montreal-Loyola), PhD (McGill)
R.A. Rodrigue, BA (Ceylon), PhD (Nottingham)
J.F. Hepburn, BSc, PhD (Carleton)
K.T. Leung, BSc, PhD (British Columbia)
T.B. Marder, BSc (Massachusetts Institute of Technology), PhD (UCLA)
L.F. Nazar, BSc (British Columbia), PhD (Toronto)

Research Assistant Professor
M.J. Chong, BSc, PhD (British Columbia), NSERC University Research Fellow

Adjunct Faculty
E. Jellum, BSc (Heriot-Watt University, Edinburgh), PhD (Oxford)
R.H. Marchesault, BSc (Montreal-Loyola), PhD (McGill)
R.A. Rodrigue, BA (Ceylon), PhD (Nottingham)
G. Scoles, Dottore in Chimica (Genova), LibDoc, FOIC
N.J. Taylor, BSc, PhD (Surrey)

Senior Demonstrators
S.O. de Silva, BSc (Ceylon), PhD (Waterloo)
C. Foister, BSc (Purdue), MSc, PhD (Rutgers)
S. Forsy, BSc (Waterloo)
T. Rudensky, BSc, PhD (Waterloo)

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
9. Faculty Member holding joint appointment with Physics.

*Also has Adjunct appointment

Course Descriptions

Chemistry

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 formules, 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 requirement for 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 123 F 3C 1T 0.5

Chemical Reactions, Equilibria and Kinetics
The stoichiometry of compounds and chemical reactions; principles of equilibria, solubility and acid-base equilibria; electrochemistry, chemical kinetics.

Prereq: Grade 13 Chemistry, Mathematics (Calculus)
Coreq. for Science students: CHEM 123L

CHEM 123L F 3L 0.25

Chemical Reaction Laboratory 1

Selected experiments for students taking CHEM 123 or 125.
CHEM 124 W,S 3C,1T 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, Mathematics (Calculus)
Coreq: CHEM 123 strongly recommended
Antireq: CHEM 124L
Antireq: CHEM 126, 128

CHEM 124L W,S 3L 0.25
Chemical Reaction Laboratory 2
Selected experiments for students taking CHEM 124 or 126.
Antireq: CHEM 124
Antireq: CHEM 124L

CHEM 125 F 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 126 W,S 3C,1T 0.5
Organic Chemistry 1
An enriched version of CHEM 124 for all students in, or planning to enter, Chemistry or Biochemistry programs.
Prereq: Same as for CHEM 124
Coreq: Same as for CHEM 124
Antireq: CHEM 124

CHEM 128 F,W 3C 0.5
Structure and Bonding
Prereq: Grade 13 Chemistry, Physics, completion of Year One in good standing or permission of instructor
Antireq: CHEM 218
For Honours students only

CHEM 218 F,2C,1T 0.5
Development of Chemical Bonding and Structure
Prereq: Grade 13 Chemistry, Physics, completion of Year One in good standing or permission of instructor
Antireq: CHEM 212

CHEM 219 W 2C,1T 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
Antireq: CHEM 313
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

CHEM 220L F,W,S 3L 0.25
Analytical Chemistry Laboratory 1
Selected experiments for students taking CHEM 220.
For Honours students only

CHEM 221 F,W,S 2C 0.5
Multi-component Analysis
Electrochemical and spectroscopic 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

CHEM 221L F,W,S 6L 0.5
Analytical Chemistry Laboratory 2
Selected experiments for students taking CHEM 221.
For Honours students only

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, 124 or 126
Antireq: CHEM 220, 221
For students in Honours Biology only

CHEM 237 F,W,S 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 284 or 266

CHEM 254 F,W 2C,1T 0.5
Physical Chemistry 1
This course emphasizes the macroscopic approach. Areas to be studied include properties of gases; the first, second and third laws of thermodynamics applied to ideal systems; chemical equilibria. Prereq: CHEM 123 or 125, MATH 113A/B or equivalent
Antireq: CHEM 356
For Honours students only

CHEM 264 F,W 3C 0.5
Organic Chemistry 2
Preparation and reactions of typical organic functional groups examined on the basis of reaction mechanisms. Stereochemistry of organic molecules.
Prereq: CHEM 124 or 126
Antireq: CHEM 36, 266
For Honours students only
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Type</th>
<th>Description</th>
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<tbody>
<tr>
<td>CHEM 265</td>
<td>F, W, S</td>
<td>Organic Chemistry 3&lt;br&gt;The detailed treatment of organic chemistry begins in CHEM 124 and 264 is continued, with further emphasis on stereochemistry, reaction mechanisms and aromaticity. Introduction to spectroscopy. Prereq: CHEM 264&lt;br&gt;Antireq: CHEM 267&lt;br&gt;For Honours students only</td>
</tr>
<tr>
<td>CHEM 266</td>
<td>F, W, 3C</td>
<td>Basic Organic Chemistry 2&lt;br&gt;More detailed discussions of the important classes of aliphatic and aromatic compounds. An extended look at stereochemistry and its importance in reaction mechanisms. Prereq: CHEM 124 or 126&lt;br&gt;Antireq: CHEM 36, 264</td>
</tr>
<tr>
<td>CHEM 266L</td>
<td>F, W, 3L</td>
<td>Organic Chemistry Laboratory 1&lt;br&gt;Selected experiments for students taking CHEM 265. Prereq: CHEM 266, 36, 265&lt;br&gt;For Honours students only</td>
</tr>
<tr>
<td>CHEM 267</td>
<td>W, 2C</td>
<td>Basic Organic Chemistry 3&lt;br&gt;A continuation of the concepts of CHEM 266; Introduction to carbohydrates, proteins, and lipids. Introduction to NMR and IR spectroscopies. Prereq: CHEM 266&lt;br&gt;Antireq: CHEM 36, 265&lt;br&gt;For students needing a full year of Organic Chemistry as a prerequisite to medicine, either the sequence 266/267 and 266L, or the sequence 264/265 and 265L, should be selected.</td>
</tr>
<tr>
<td>CHEM 311</td>
<td>W, 2C</td>
<td>Radiochemistry&lt;br&gt;An introduction to nuclear stability rules, radioactive decay processes and nuclear structure. Alpha, beta, gamma emission. Nuclear reactions, fission, production of heavy elements. Interaction of radiation with matter. Radioisotopes. Brief introduction to actinide chemistry. Prereq: Grade 13 Chemistry, completion of Year 1 in good standing or permission of instructor</td>
</tr>
<tr>
<td>CHEM 312</td>
<td>F, W, 2C</td>
<td>Transition Metal Chemistry&lt;br&gt;The transition elements and their compounds: Stereochemistry of complexes; ligand field and molecular orbital theories of metal/ligand bonding; electronic spectra and magnetoo-chemistry of complexes; reaction mechanisms (if time permits). Prereq: CHEM 212&lt;br&gt;Antireq: CHEM 316&lt;br&gt;For Honours students only</td>
</tr>
<tr>
<td>CHEM 313</td>
<td>W, 2C</td>
<td>Chemistry of Main Group Elements&lt;br&gt;A systematic approach to the syntheses, properties, reactions and structures of compounds of the main group elements. Trends in chemical behaviour, bonding and stereochemistry. Electron-deficient compounds, the rare gases, chemistry of phosphorus, nitrogen and sulfur will be dealt with in detail. Prereq: CHEM 212&lt;br&gt;Antireq: CHEM 219&lt;br&gt;For Honours students only</td>
</tr>
<tr>
<td>CHEM 314L</td>
<td>F, W, S</td>
<td>Inorganic Chemistry Laboratory 1&lt;br&gt;An introduction to practical inorganic chemistry. Coreq: CHEM 312 or 313&lt;br&gt;For Honours students only</td>
</tr>
<tr>
<td>CHEM 315L</td>
<td>F, W, 6L</td>
<td>Inorganic Chemistry Laboratory 2&lt;br&gt;Advanced experiments in inorganic chemistry. Prereq: CHEM 314L&lt;br&gt;For Honours students only</td>
</tr>
<tr>
<td>CHEM 316</td>
<td>F, W, 2C, 1T</td>
<td>Coordination Chemistry&lt;br&gt;A basic coverage of first row transition elements for General and certain Honours students; preparation, nomenclature and general chemistry of transition metal complexes emphasizing structure, bonding, physical properties such as colour and magnetism, and chemical reactions. Prereq: CHEM 218 or 212&lt;br&gt;Antireq: CHEM 312&lt;br&gt;By correspondence only</td>
</tr>
<tr>
<td>CHEM 331L</td>
<td>W, 3L</td>
<td>Analytical Separations&lt;br&gt;Basic principles, instrumentation and methods of liquid and gas chromatography. Prereq: CHEM 221 or permission of instructor</td>
</tr>
<tr>
<td>CHEM 332</td>
<td>F, S, 2C</td>
<td>Structural Biochemistry&lt;br&gt;Determination of concentration, structure and sequence of proteins, nucleic acids and polysaccharides. Protein synthesis. Enzyme kinetics, Coenzymes. Prereq: CHEM 237&lt;br&gt;Ccoreq: CHEM 265 or 267</td>
</tr>
<tr>
<td>CHEM 333</td>
<td>F, W, 2C</td>
<td>Metabolism I&lt;br&gt;Metabolism of carbohydrates, lipids and amino acids. Prereq: CHEM 237&lt;br&gt;Ccoreq: CHEM 265 or 267</td>
</tr>
<tr>
<td>CHEM 334L</td>
<td>F, W, 3L</td>
<td>Advanced Biochemistry Laboratory&lt;br&gt;Selected experiments for students taking CHEM 332 and CHEM 333. Prereq: One term course in biochemistry beyond CHEM 237</td>
</tr>
<tr>
<td>CHEM 350</td>
<td>W, 2C</td>
<td>Spectroscopy and Molecular Structure&lt;br&gt;Introduction to concepts and applications of microwave, Raman, IR, electronic and resonance spectroscopy with respect to molecular parameters. Prereq: CHEM 355</td>
</tr>
<tr>
<td>CHEM 353</td>
<td>F, S, 3C</td>
<td>Introduction to Polymer Science&lt;br&gt;Basic definitions and polymer nomenclature, molecular weight averages and distributions, constitutional and configurational isomorphism, rubber elasticity, step-growth and free radical chain growth polymerizations, emulsion polymerization. Prereq: CHEM 254, 264 or equivalents&lt;br&gt;Antireq: CHEM 237</td>
</tr>
<tr>
<td>CHEM 355</td>
<td>F, W, S, 2C</td>
<td>Physical Chemistry 3&lt;br&gt;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 255, MATH 215 or equivalent&lt;br&gt;Antireq: PHYS 354&lt;br&gt;For Honours students only</td>
</tr>
<tr>
<td>CHEM 355L</td>
<td>F, W, S, 3L</td>
<td>Physical Chemistry Laboratory 1&lt;br&gt;Selected experiments for students taking CHEM 355. Prereq: CHEM 212, 221L&lt;br&gt;For Honours students only</td>
</tr>
</tbody>
</table>
CHEM 356 F, W 2C, 1T 0.5
General Physical Chemistry
An introductory survey of the thermodynamics of ideal systems: the application of thermodynamic principles to the study of solutions, phase equilibria, chemical equilibrium and the properties of electrolytes.
Prereq: CHEM 123 or 125, MATH 113A/B or equivalent
Antireq: CHEM 264

CHEM 356L F, W 3L 0.25
General Physical Chemical Laboratory 1
Selected experiments for students who have taken CHEM 356.
Prereq: CHEM 356
A special section in Winter term will be available for Honours Biochemistry students only.

CHEM 357 W 2C, 1T 0.5
Physical Chemistry for the Life Sciences
An introductory survey of kinetic molecular theory and transport phenomena with applications to biological systems. Chemical kinetics. Some spectroscopies important to life sciences.
Prereq: CHEM 123 or 125, MATH 113A/B or equivalent

CHEM 357L W 3L 0.25
General Physical Chemistry Laboratory 2
Selected experiments for students taking CHEM 357.
Prereq: CHEM 356L

CHEM 358 F, W 2C, 1T 0.5
Physical Chemistry 4
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 355
For Honours students only

CHEM 358L F, W 6L 0.5
Physical Chemistry Laboratory 2
Selected experiments for students taking CHEM 358.
Prereq: CHEM 355L
For Honours students only

CHEM 362 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 mechanism of organic reactions.
Prereq: CHEM 265
Coreq: CHEM 368

CHEM 363 W 2C 0.5
Applied Organic Chemistry
The organic chemistry involved in selected industrial processes will be discussed. Petroleum chemistry, synthesis of dyes, pharmaceuticals, pesticides, organic polymers, etc.
Prereq: CHEM 266 or 267

CHEM 366 F 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 F 3L 0.25
Organic Chemistry Laboratory
Selected experiments for students taking CHEM 366.

CHEM 368 F, W, S 2C 0.5
Organic Chemistry 4
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 380 F, W 1C, 3T 0.5
Chemical Problem Solving by Computer
Analysis of chemical problems, development of mathematical and numerical models and algorithms, implementation of programs using procedure-oriented languages (BASIC, FORTRAN, PASCAL), simulations and calculations on chemical processes, data reduction and treatment.
Prereq: CS 102 or equivalent, good standing in Year Two or higher of a chemistry program.
Formerly CHEM 290

CHEM 392A F, W, S 16L 1.5
Research Project 2
For students in the degree-by-thesis program.

CHEM 395 W (odd years only) 3C 0.5
History of Chemistry
The development of chemistry will be traced from alchemy to the 20th century. The contributions of famous scientists to the concepts and models of modern chemistry will be emphasized.
Prereq: Completion of two years of a Chemistry Honours program

CHEM 407 F 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.
Strongly recommended for all chemistry majors.

CHEM 409 W (odd years only) 2C 0.5
Solid State Chemistry
Packing in solids; metals, alloys and molecular crystals; ionic and covalent solids; chemical factors affecting crystal structures; properties of metals, semiconductors and molecular crystals.
Prereq: CHEM 312 or 313

CHEM 411 F 2C 0.5
Organometallic Chemistry
Prereq: CHEM 312

CHEM 416 W 2C 0.5
Applied Inorganic Chemistry
The chemistry of inorganic compounds and processes of industrial importance will be discussed. Inorganic polymers; catalysis by inorganic systems including nitrogen fixation, hydrogenation, hydroformylation. Extraction and purification of metals.
Prereq: CHEM 312

CHEM 436 W 2C 0.5
Industrial Chemistry
An introductory survey of the thermodynamics of ideal systems: the application of thermodynamic principles to the study of solutions, phase equilibria, chemical equilibrium and the properties of electrolytes.
Prereq: CHEM 123 or 125, MATH 113A/B or equivalent
Antireq: CHEM 264

CHEM 436L F, W 3L 0.25
General Physical Chemistry Laboratory 1
Selected experiments for students who have taken CHEM 436.
Prereq: CHEM 436
A special section in Winter term will be available for Honours Biochemistry students only.

CHEM 457 W 2C, 1T 0.5
Physical Chemistry for the Life Sciences
An introductory survey of kinetic molecular theory and transport phenomena with applications to biological systems. Chemical kinetics. Some spectroscopies important to life sciences.
Prereq: CHEM 123 or 125, MATH 113A/B or equivalent

CHEM 457L W 3L 0.25
General Physical Chemistry Laboratory 2
Selected experiments for students taking CHEM 457.
Prereq: CHEM 456L

CHEM 458 F, W 2C, 1T 0.5
Physical Chemistry 4
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 455
For Honours students only

CHEM 458L F, W 6L 0.5
Physical Chemistry Laboratory 2
Selected experiments for students taking CHEM 458.
Prereq: CHEM 455L
For Honours students only

CHEM 480 F, W 1C, 3T 0.5
Chemical Problem Solving by Computer
Analysis of chemical problems, development of mathematical and numerical models and algorithms, implementation of programs using procedure-oriented languages (BASIC, FORTRAN, PASCAL), simulations and calculations on chemical processes, data reduction and treatment.
Prereq: CS 102 or equivalent, good standing in Year Two or higher of a chemistry program.
Formerly CHEM 290

CHEM 492A F, W, S 16L 1.5
Research Project 2
For students in the degree-by-thesis program.

CHEM 495 W (odd years only) 3C 0.5
History of Chemistry
The development of chemistry will be traced from alchemy to the 20th century. The contributions of famous scientists to the concepts and models of modern chemistry will be emphasized.
Prereq: Completion of two years of a Chemistry Honours program

CHEM 507 F 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.
Strongly recommended for all chemistry majors.

CHEM 509 W (odd years only) 2C 0.5
Solid State Chemistry
Packing in solids; metals, alloys and molecular crystals; ionic and covalent solids; chemical factors affecting crystal structures; properties of metals, semiconductors and molecular crystals.
Prereq: CHEM 312 or 313

CHEM 511 F 2C 0.5
Organometallic Chemistry
Prereq: CHEM 312

CHEM 516 W 2C 0.5
Applied Inorganic Chemistry
The chemistry of inorganic compounds and processes of industrial importance will be discussed. Inorganic polymers; catalysis by inorganic systems including nitrogen fixation, hydrogenation, hydroformylation. Extraction and purification of metals.
Prereq: CHEM 312

CHEM 536 W 2C, 1T 0.5
Applied Organic Chemistry
The organic chemistry involved in selected industrial processes will be discussed. Petroleum chemistry, synthesis of dyes, pharmaceuticals, pesticides, organic polymers, etc.
Prereq: CHEM 266 or 267

CHEM 536L F 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 536L F 2C 0.5
Organic Chemistry Laboratory
Selected experiments for students taking CHEM 536.

CHEM 538 F, W, S 2C 0.5
Organic Chemistry 4
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 538L F, W, S 6L 0.5
Organic Chemistry Laboratory 2
Selected experiments for students taking CHEM 538.
For Honours students only

CHEM 580 F, W 1C, 3T 0.5
Chemical Problem Solving by Computer
Analysis of chemical problems, development of mathematical and numerical models and algorithms, implementation of programs using procedure-oriented languages (BASIC, FORTRAN, PASCAL), simulations and calculations on chemical processes, data reduction and treatment.
Prereq: CS 102 or equivalent, good standing in Year Two or higher of a chemistry program.
Formerly CHEM 290

CHEM 592A F, W, S 16L 1.5
Research Project 2
For students in the degree-by-thesis program.
CHEM 417 W (odd years only) 2C 0.5
Inorganic Cage Compounds
The synthesis, structure and reactions of selected groups of important cage compounds such as metal clusters, metallaboranes, boranes, and carbon molecules will be considered. The emphasis is on current literature. The course is available on a special self-study basis or by regular lectures.
Prereq: CHEM 312 or 313

CHEM 419 W 2C 0.5
Biological Aspects of Inorganic Chemistry
Metalloproteins and other metal-containing biological molecules in hydrolytic enzymes; redox reactions; nitrogen fixation and oxygen transport; the role of alkaline and alkaline earth metal cations.
Prereq: CHEM 312 or 316

CHEM 420 W 2C 0.5
Analytical Chemistry
Selected topics in modern analysis of inorganic materials such as rocks, ores, ceramics, metals and alloys; atomic flame spectroscopic methods, analytical X-ray techniques, methods for ultrapure materials, trace and micro determinations.
Prereq: CHEM 221 or permission of instructor

CHEM 421 W 2C 0.5
Mass Spectral and Chromatographic Analysis
Techniques and fundamental principles of combining chromatography and mass spectrometry for the identification of chemical compounds.
Prereq: CHEM 320, 264, or permission of instructor

CHEM 422 F 2C 0.5
Thermal and Electrical Analytical Methods
Techniques and fundamental principles of thermal and electroanalytical methods.
Prereq: CHEM 221 or permission of instructor

CHEM 432 F 2C 0.5
Metabolism 2
Prereq: CHEM 333
Coreq: CHEM 332

CHEM 433 W 2C 0.5
Advanced Biochemistry
Oxidative phosphorylation, vision, Melanoid acid pathways, Serine proteases, Prostaglandins, Salt balance, Respiration.
Prereq: CHEM 333

CHEM 434 W 2C 0.5
Special Topics in Biochemistry
Special topics in biochemistry with applications. Areas covered in recent years include biochemistry of methane-producing bacteria; mechanism of action of antibiotics, antiviral agents and vitamins.
Prereq: CHEM 333

CHEM 435 F 2C 0.5
Bioorganic Mechanisms
Modern techniques of biosynthetic studies. Enzyme reaction mechanisms.
Prereq: CHEM 237 and one of 366, 386

CHEM 452 F 2C 0.5
Colloids, Liquid Crystals and Bilayer Chemistry
The colloidal size range, the importance of the interface, classical studies on Brownian motion, light scattering, the micelle formation of detergents in water and solubilisation. Phase diagrams of soaps and lipids and their study by X-ray diffraction and NMR. The biological membrane as an entity of colloidal size. The related spectroscopy, microscopy, etc. of lyotropic liquid crystals and bilayers.
Prereq: CHEM 255

CHEM 453 W 2C 0.5
Polymers Properties and Polymerization
Copolymerization, ionic and coordinate polymerizations, introduction to polymer reaction engineering, mechanical properties of polymers, polymer mixtures.
Prereq: CHEM 353 or equivalent
Antireq: CHEM 541

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 358

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 366

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 255

CHEM 457 W 1C.8L 0.5
Experimental Aspects of Polymer Science
Selected experiments to illustrate polymerization, polymer properties and fabrication processes.
Prereq: CHEM 353 or equivalent
Antireq: CHEM 543

CHEM 458 F 2C 0.5
Quantum Chemistry
The nature of electronic structure and chemical bonding in H2+ and other simple molecules and its implications for theories of chemical reactions.
Prereq: CHEM 355

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 465B and 465B provided topics are different).
Prereq/Coreq: CHEM 368

CHEM 469 A 8L 0.75
Advanced Laboratory
Laboratory work on a senior year research project. See CHEM 492 for co-ordinator for descriptive booklet and details.
For Honours students only

CHEM 492 B 8L 0.75
A continuation of CHEM 492. No credit or grade is given for the first term course unless the two term sequence, CHEM 492A/B, is completed.

CHEM 495 F 8L 1.5
Research Project 3
Only for students in the degree-by-thesis program.

CHEM 495 B 8L 1.5
Research Project 4
Only for students in the degree-by-thesis program.
Department of Civil Engineering

Course Descriptions

Civil Engineering Concepts
A continuation of GEN E 115 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 and including specification development, information-gathering, concept formulation, feasibility analysis and report writing.

CIV E 203 F,W 2C,2T 0.5
Statics
Equilibrium of rigid and deformable bodies. Analysis of internal forces in structures; beams, cables, arches, trusses.

CIV E 204 F,W 3C,1T 0.5
Mechanics of Solids
1 Stress-strain-temperature relationships.

CIV E 205 F,S 3C,1T 0.5
Mechanics of Solids

CIV E 221 F,W 3C,1T 0.5
Calculus

CIV E 222 F,S 3C,1T 0.5
Differential Equations

CIV E 223A F,W 1C,3T 0.25
Computer Workshop A
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.
CIV E 223B S,F 1C,3T 0.25
Computer Workshop B
An introduction to the use of Microcomputers, Spreadsheets and Word Processors; Application to problems in Civil Engineering.
Five weeks only
For Civil and Geological Engineering students only

CIV E 224 F,W 2C,2T 0.5
Probability and Statistics

CIV E 225 F,S 2C,2T 0.5
Geology for Engineers
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. Field trip.

CIV E 253 S,F 2C,2T 0.5
Structure and Properties of Materials

CIV E 265 F,W 3C,1T,3L 0.5
Fluid Mechanics and Thermal Sciences
An introduction to fluid mechanics and thermal sciences. Fluid properties, fluid statics; thermodynamic principles; Bernoulli equation; the momentum equation and applications; laminar and turbulent flow; closed conduit flow; pipe network analysis; dimensional analyses and similitude; steady flow in pipes; heat transfer. 4 lab sessions.

CIV E 290 S,F 4C,2T,2L 0.75
Survey Camp
A one-week course in surveying. Introduction to surveying, length measurements, levelling, transit surveys. Approximate cost to each student $135.

CIV E 291 F 1 wk flk lab 0.5

CIV E 292 F,W 2C,2T 0.5
Engineering Economics
An introductory course on the principles of engineering economy. Basic concepts; capital; interest formulas and derivations; annual worth comparisons; present worth; return on investment; benefit-cost ratio depreciation effect of taxes.

CIV E 298 S,F 2S 0.0
Seminar
The engineer in society. Principles, methods and practice of Civil Engineering. Informal lectures.

CIV E 300 W,S 2C,2T 0.5
Civil Engineering Project 1
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.

CIV E 303 W,S 3C,1T 0.5
Structural Analysis

CIV E 306 F,W 2C,2T 0.5
Mechanics of Solids 3

CIV E 313 F,W 3C,1T 0.5
Structural Concrete Design 1
Reinforced Concrete Members. Concrete and reinforcing steel materials. Safety, loads, design criteria. Flexure, shear, combined bending and axial force. Serviceability. One-way slabs, beams, columns, foundations and retaining walls. 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 2C,2T 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
Basic concepts needed to explore current issues in Urban Transportation; includes planning models of trip generation, mode split distribution and assignment. Evaluation of transport proposals based on the decision environment and extensions of engineering economics. Basic notions of system continuity, historical perspectives and system operating characteristics are addressed.

CIV E 353 W,S 3C,1T,2L 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
Foundation engineering; earth pressure theories; retaining walls; anchors; shallow and deep foundations; braced trenches and excavations; slope stability. Prereq: CIV E 353

CIV E 375 W,S 3C,1T,2L 0.5
Water Quality Engineering

CIV E 381 F,W 3C,1T 0.5
Hydraulics
Open channel flow; flood routing; dams; spillways; gates and culverts; pumps and turbines; flood mapping; urban drainage.

CIV E 390 W,W 2S 0.0
Seminar
The engineer in society. Principles, methods and practice of Civil Engineering. Informal lectures.
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.

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.

Structural Analysis 2
Advanced structural analysis of planar and space frameworks, linear and non-linear behaviour. Computer Applications.

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.

Structural Dynamics

Building Sciences and Technology
The building process; loadings: gravity, wind, thermal, moisture, fire, enclosure design: walls, windows, roof; subgrade characteristics; energy related considerations: energy load, economics

Structural Steel Design
Structural steel members. Limit states design, loads, materials. Design of tension and compression members, beams and beam-columns. Composite design and plate girders. Connections. Fatigue

Structural Concrete Design 2

Finite Element Analysis
Introduction to the Finite Element Methods in field problems. Applications to the theory using available computer programs.

Experimental Mechanics

Transport Systems Analysis
Introduction to basic concepts of transport systems analysis: systems analysis framework, accounting methods, experimental design techniques, decision theory, basic approaches to simulation modelling. The emphasis is on development of methods of analysis, for application to selected case studies in the transport sector.

Pavement Structural Design
Pavement design, soil identification, subgrade design, base courses, flexible pavement design, design and testing of asphaltic concrete mixes, surface treatments.

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.

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.

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
Transport Systems Analysis
Introduction to basic concepts of transport systems analysis: systems analysis framework, accounting methods, experimental design techniques, decision theory, basic approaches to simulation modelling. The emphasis is on development of methods of analysis, for application to selected case studies in the transport sector.

CIV E 430 W 2C,2L 0.5
Experimental Mechanics

CIV E 440 W 2C,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.

CIV E 442 W 2C,1L 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.

CIV E 445 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.

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.

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.

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.

CIV E 473 W 2C,2T 0.5
Contaminant Transport

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 operation and research techniques, management. Benefit-cost analysis. Social, political, legal and ecological considerations.

CIV E 486 S,F 3C,1T 0.5
Hydrology
Basic hydraulics; principles of reservoir design: mathematical modelling of hydrologic budget; data networks; design events; urban hydrology.
Department of Classical Studies

Professor: Chairman of the Department
P. Forsyth, AB (Mount Holyoke), MA, PhD (Toronto), Recipient of the Distinguished Teacher Award

Associate Professor and Undergraduate Officer
R.L. Fowler, BA, MA (Toronto), DPhil (Oxford)

Professors
P. Keresztes, MA (Toronto), PhD (Graz)

Assistant Professors
L.A. Curchin, BA (Western Ontario), MA (Toronto, Carleton), PhD (Ottawa)
S.B.P. Haag, BA, MA (Queen's), MA (Waterloo), MPhil (Toronto)
L. Neuri, BA (San Francisco), MA (Oregon), PhD (McMaster)
R.L. Porter, BA (McMaster), MA, PhD (Princeton)

Participating Faculty in Classics at Wilfrid Laurier University
A. Foley, BA, MA (McGill), PhD (London)
H.A. MacLean, BA (McMaster), MA, PhD (Wisconsin)
G.P. Schaus, BA, MA (Dalhousie), PhD (Pennsylvania)
G.R. Vaillie, BA, MA (McGill), PhD (Chicago)
J. Zeyl, BA, MA (Toronto), PhD (McMaster)

Faculty Member of Classical Studies holding cross appointment to:
1 Fine Arts

Course Descriptions

CLASSICAL STUDIES
(Courses in Translation)

Introductory Notes

1. Students should consult with the departmental Undergraduate Advisor for the latest information on course offerings.
2. CLAS courses were formerly designated CIV.

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.

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; Penciles and the Rise of Democracy; Socrates, Man and Martyr; Alexander the Great and The Age of Expansion.

Colossos - The Major Figures of Ancient Rome
An introductory study of the achievement of ancient Rome through some of its most 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.

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.

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.

Greek History
A survey of ancient Greece, emphasizing its political, military, social and economic aspects.

Students are advised to preregister early for this course as enrolment is limited.
A study of selected social problems in ancient Greece and Rome. Each year, or Latin is needed.

This course focuses upon the dramatic literature of the classical age in Athens. It features the Crete's play 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.

This course examines ancient epic through the Iliad and Odyssey of Homer, the Argonautica of Apollonius Rhodius and the Aeneid of Vergil. The evolution of the epic genre is traced in lectures and discussions. No knowledge of Greek or Latin is needed.

This course examines ancient epic, including the birth of the gods, creation, the Olympians, Prometheus and the fall, the flood, the ages of man, and the Greek mystery religions.

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.

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.

This course is acceptable for credit by the History Department (but not as a senior seminar).

This course is acceptable for credit by the History Department, or instructors permission.

This course is acceptable for credit by the History Department, or instructors permission.

This course is acceptable for credit by the History Department, or instructors permission.
Course Descriptions
Classical Studies

16.33

GREEK
Courses not offered in the current academic year are listed at the end of this section.

GRK 100A 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 100B 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.

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).

GRK 232 W 3C 0.5
Selections from Greek Authors
A literature course designed to follow GRK 231. Authors normally read are Euripides, Thucydides and Plato.

GRK 262 3C 0.5
Introduction to Plato
Selections from Plato.

GRK 301 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.

GRK 362 F 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.

GRK 371 3C 0.5
Introduction to the Greek Historians
Selections from Xenophon and others.

GRK 372 3C 0.5
Herodotus
Selections from the Persian Wars.

GRK 452 3C 0.5
Homer
Extended reading of Homer.

GRK 461 The Drama of Aeschylus

GRK 462 The Comedy of Aristophanes

GRK 471 Thucydides

GRK 482 The Philosophy of Aristotle

LATIN
Courses not offered in the current academic year are listed at the end of this section.

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 272 3C 0.5
An Introduction to Vergil
Selections from the Works of Vergil.

GRK 271 Helenistic and Later Greek Literature
GRK 351 Greek Composition and Grammar
GRK 361 The Drama of Euripides

LAT 272 3C 0.5
An Introduction to Vergil
Selections from the Works of Vergil.

GRK 100B, Grade 13 Greek or instructor’s permission.
LAT 301 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.

Prereq: One full 200-level course in LAT or instructor's permission

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.

Prereq: One full 200-level course in LAT or instructor's permission

LAT 363 3C 0.5
**Roman Comedy**
The study in Latin of at least one play by Plautus or Terence, with supplementary readings in translation.

Prereq: One full 200-level course in LAT or instructor's permission

LAT 371 F 3C 0.5
**Introduction to the Roman Historians**
Selections from Sallust and Livy; a study of the development of Roman historiography.

Prereq: One full 200-level course in LAT or instructor's permission

LAT 461 F 2S 0.5
**Vergil 1**
Selections from Aeneid 1-6. Offered 1987-88 at Wilfrid Laurier

LAT 471 W 3C 0.5
**Roman Elegy**
Selections from Catullus, Ovid, Propertius and Tibullus.

LAT 491-494
**Senior Seminars**
By arrangement with the department, an individual student or a small group of students will follow a course of study under the supervision of a faculty member.
Senior standing or instructor's permission is a prerequisite for any 400-level Latin course.

COURSES NOT OFFERED 1987-88
LAT 261 Latin Prose 1
LAT 262 Latin Prose 2
LAT 281 Latin Poetry 1
LAT 282 Latin Poetry 2
LAT 351 Latin Composition and Grammar

LAT 352 The History of the Latin Language
LAT 362 Lucretius
LAT 372 Tacitus
LAT 381 Medieval Latin 1
LAT 382 Medieval Latin 2
LAT 462 Vergil 2
LAT 481 Roman Satire 1
LAT 482 Roman Satire 2
See departmental Undergraduate Advisor for latest information on course offerings.

Dance Group

Associate Professor, Chairman of Dance Group
R. Priddle, BPHE (Toronto), MSc (Springfield), MA (Waterloo), PhD (Waterloo)

Associate Professor, Undergraduate Officer
R. Ryman, BA, MA (York), Al Chor (London)

Assistant Professors
J. Chapman, BA, MA (York), PhD (CNAA, England)
J. Officer, ARAD (Adv. and ATC), (London), Recipient of the Distinguished Teacher Award

Lecturers
L. Prada, BSc (Waterloo), ARAD (Adv. and IT), (London)

Course Descriptions

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**
A survey of the evolution of dance as both ritual and art. Extensive viewing of films as well as lectures and workshop sessions. No dance background necessary.

**DANCE 111 W 2C,2std 0.5**
**The Elements of Dance**
An in-depth 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 232 F 3C 0.5**
**Survey of Ballet History**
The course examines the development of ballet from the Renaissance to contemporary times, focusing on the nature of dance of the past and its changes within a cultural context. Major personalities, events and forms, as well as social influences are assessed for their impact on the art.

Not for Dance Majors

**DANCE 233 W 3C 0.5**
**A History of Modern Dance**
The course examines the major choreographic innovators, who have philosophically and stylistically shaped the modern dance idiom.

Prereq: DANCE 230
Ofered alternate years

**DANCE 234 F 3hrs/wk 0.5**
**Women in Western Theatre Dance**
The achievements of women in dance will be viewed in the context of the woman's place in artistic and social hierarchies, as well as in the light of the disadvantages and advantages experienced due to being female. Autobiographies, biographies, films, videos, and historical accounts will be consulted.

**DANCE 242 F 3C 0.5**
**Labanotation 1**
A theoretical and practical introduction to Labanotation to the elementary level.
Prereq: Two courses in dance technique or consent of the instructor
Offered alternate years

**DANCE 264 F 2G 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 emphasize creative dance activities for school-age children. Opportunity is available to work with children in an applied setting.
Prereq: DANCE 111
Antireq: DANCE 264B and 264C
DANCE 264B F 2C IT
Developmental Aspects of Movement
A study integrating the theoretical and applied aspects of motor and perceptual motor development in children and adolescents. Tutorials will focus on movement education with preschool children. Opportunity is available to work with children in an applied setting.
Prereq: Early Childhood Education
Students only
Antireq: DANCE 264A and 264C

DANCE 264C F 2C IT
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: DANCE 264A and 264B

DANCE 336 F 3C 0.5
Dance Criticism
This course examines critical dance literature historically and stylistically, and introduces students to practical skills in writing dance criticism.
Prereq: DANCE 231 or 233

DANCE 342 W 3C 0.5
Labanotation 2
This course examines the basic theoretical concepts of Labanotation to the intermediate level. Emphasis is placed both on reading and writing dance scores.
Prereq: DANCE 242
Offered alternate years

DANCE 343 F 3 1/2 hrs/wk 0.5
An Historical Survey of Dance Notation Systems
A survey of graphical systems for recording dance, from the basse notation of the late 15th century to the universally applied systems of the present.

DANCE 351 W 2C, 2std 0.5
Ballet Choreography
Analysis and study of themes and styles of 20th-century ballet. Through film and studio experience, consideration is given to the adaptation of the classical idiom to the artistic trends of the century.
Prereq: DANCE 111, 231 and 192D

DANCE 410A/B/C/D 3C
Honours Dance Major Paper
Students will examine dance research from different approaches including experimental, descriptive, ethnological, historical and philosophical.
Prereq: Honours Dance students only
Students must register in one of the following:
DANCE 410A and
DANCE 411A Biomechanics Area - Honours Bachelor of Science degree only.
Prereq: DANCE 366, 367, KIN 102, 200, 222, 321, 425 (KIN 425 may be taken as a Coreq.)
Exercise Physiology, Fitness and Dance Injury, Prevention and Care - Honours Bachelor of Science degree only
Prereq: DANCE 366, KIN 102, 200, 300, 335, 340, 346

DANCE 410E and
DANCE 411B Skill Learning
Prereq: DANCE 264, 366, 367, KIN 255, 330

DANCE 410D and
DANCE 411D: Dance Notation
Prereq: DANCE 241, 341 and 482 or 474 (Baneshe) or DANCE 242, 342 and 482 or 474 (Labanotation)

DANCE 410E and
DANCE 411E: Dance History
Prereq: DANCE 230, 231, 233, 333

DANCE 410F and
DANCE 411F: Developmental Studies with Children in Dance
Prereq: DANCE 264, 366, 367, 484
Recommend auditing KIN 330 and 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.
The course may be repeated in subsequent 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 determined by student interests. Topics available include:
DANCE 480 Historical Dance
Prereq: DANCE 230 and 231
DANCE 481 Ballet Choreography
Prereq: DANCE 351 and 292D or equivalent
Coreq: DANCE 391D
DANCE 482 Dance Notation Reconstruction
Prereq: DANCE 341 or 342
DANCE 483 Modern Dance Composition
Prereq: DANCE 353 and 394D or equivalent
Coreq: DANCE 493D
DANCE 484 Developmental Perspectives of Creative Movement with Children
Prereq: DANCE 364 and 242
DANCE 486 Dance Criticism
Prereq: DANCE 336 and 2 of DANCE 231/233/333
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 sufficient enrolment.

Technique Courses
0.25
Each of the following technique courses consists of two 1-1/2 hour classes per week. Students are advised to check with their home department regarding the acceptability of Technique Courses for credit.

DANCE 191D Pre-Elementary Ballet I F
DANCE 192D Pre-Elementary Ballet II W
DANCE 193D Pre-Elementary Modern Dance I F
DANCE 194D Pre-Elementary Modern Dance II W
DANCE 291D Elementary Ballet I F
DANCE 292D Elementary Ballet II W
DANCE 293D Elementary Modern Dance I F
DANCE 294D Elementary Modern Dance II W
DANCE 391D Intermediate Ballet I F
DANCE 392D Intermediate Ballet II W
DANCE 393D Intermediate Modern Dance I F
DANCE 394D Intermediate Modern Dance II W
DANCE 491D Advanced Ballet I F C.D. Abel, BA (Queen's), MA, PhD (Toronto), LRAM (Speech and Drama)
DANCE 492D Advanced Ballet II W
DANCE 493D Advanced Modern Dance I F M.G. van Dijk, BA, MA (Wellington), PhD (Toronto)
DANCE 494D Advanced Modern Dance II W

COURSES NOT OFFERED 1987-88
DANCE 220 Socio-cultural Study of Western Dance
DANCE 221 Socio-Cultural Study of Non-Western Dance
DANCE 225 Dance Ethnology
DANCE 231 History of Ballet in the 20th Century
DANCE 241 Benesh Notation 1
DANCE 252 Festivals: Mediators in Multiculturalism
DANCE 325 Canadian Perspectives on Theatre Dance
DANCE 333 Canadian Perspectives on Theatre Dance
DANCE 341 Benesh Notation 2
DANCE 353 Modern Dance Composition
DANCE 366 Developmental Foundations of Dance Technique
DANCE 367 Developmental Aspects of Movement Learning

Drama and Theatre Arts Group

Associate Professor, Chairman
W.R. Chadwick, BA, MA (Toronto), PhD (London)

Assistant Professor, Undergraduate Officer
C.D. Abel, BA (Queen's), MA, PhD (Toronto), LRAM (Speech and Drama)

Assistant Professor
M.G. van Dijk, BA, MA (Wellington), PhD (Toronto)

Lecturer, Technical Director
A. Anderson

Course Descriptions
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 101A 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 101B 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.
Prereq/Coreq: DRAMA 101A or B
Limited Enrolment

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, 102 and permission of the instructor
Limited enrolment

DRAMA 222 W 6L 0.5
Intermediate Acting 2
An extension of Drama 221.
Prereq: DRAMA 221 and permission of the instructor

DRAMA 223 F,W,S 4L 0.5
Speech Communication 1
Theory and practice of public speaking. Course involves design and delivery of various kinds of speeches, and the development of organizational, vocal, listening and critical skills.

DRAMA 224 F,W,S 4L 0.5
Speech Communication 2
Complex Speech Situations Principles and practice of formal and informal meetings, communication for group decision-making, interviewing and media relations.
Prereq: DRAMA 223

DRAMA 243 F 2C,2L 0.5
Introduction to Technical Production 1
Theory and practice of building, painting, rigging and shifting scenery; construction of properties; familiarity with lighting instruments, sound equipment and their control systems. Students must spend a certain number of hours working on department productions.
Prereq: Permission of the instructor

DRAMA 244 W 2C,2L 0.5
Introduction to Technical Production 2
An extension of the studies described in DRAMA 243.
Prereq: DRAMA 243

DRAMA 251 F 3C 0.5
Survey of Dramatic Literature and Dramatic Theory 1
The Greek and Roman periods.
Cross-listed as CLAS 266

DRAMA 252 3C 0.5
Survey of Dramatic Literature and Theory 2
The Middle Ages, the Elizabethans and Jacobean (excluding Shakespeare) and the Spanish Golden Age.

DRAMA 253 3C 0.5
Survey of Dramatic Literature and Theory 3
French neo-classicism, the Restoration period and sentimental drama.

DRAMA 254 3C 0.5
Survey of Dramatic Literature and Theory 4
The late 18th, 19th and early 20th centuries, romanticism and naturalism.
Course Descriptions

Drama and Theatre Arts

DRAMA 255 3C 0.5
Survey of Dramatic Literature and Theory 1
Dramatic literature of the 20th century.

DRAMA 256 3C 0.5
Survey of Dramatic Literature 2
A survey of the modern drama of Australia, New Zealand, and the drama in English, of Africa and the West Indies.

DRAMA 258 3C 0.5
Masterpieces of Western Drama – A Study of Performance 1
Plays of film. This course will entail studying a play and then viewing it as a movie.

DRAMA 261 F 3C 0.5
Introduction to Directing 1
A study of theories of the modern stage, the emergence of the director and the principles of stage direction, with special reference to the work of Stanislavski and Brecht.
Prereq: DRAMA 101A, 101B, 102, at least one dramatic literature class and permission.

DRAMA 262 3L 0.5
Introduction to Directing 2
A workshop course consisting of the preparation of one or more detailed production books. Interpretation and analysis will be emphasized.
Prereq: DRAMA 261, two dramatic literature classes, and permission.

DRAMA 301 F 3C 0.5
Script Interpretation 1
Advanced study and analysis of plays in the process of production covering selected periods and types of playwriting. May include production casebook.

DRAMA 302 W 3C 0.5
Script Interpretation 2
An extension of the studies described above in 301.

DRAMA 306 A/B/C 3L 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 3L 0.5
Special Studies in Theatre Production 2
See Drama 306.
Prereq: Permission of the play director.

DRAMA 321 F 6L 0.5
Advanced Acting 1
Advanced work in acting. Course involves individual and ensemble work in selections from specific plays with attention given to various periods and styles in acting.
Prereq: DRAMA 221, DRAMA 222, and permission of the instructor.
Usually restricted to Drama majors.

DRAMA 322 W 6L 0.5
Advanced Acting 2
An extension of the studies described in DRAMA 321.
Prereq: DRAMA 321 and permission of the instructor.

DRAMA 326 F 4L 0.5
Seminar in Voice 1
A workshop course in voice for the actor, designed to increase vocal power, range, flexibility and variety in presenting the spoken word.
Prereq: Coreq: DRAMA 221

DRAMA 327 W 4L 0.5
Seminar in Voice 2
An extension of the studies described in DRAMA 326.
Prereq: DRAMA 326

DRAMA 331 F 3LD 0.5
Design for the Theatre 1
An introduction to the problems of designing for the theatre. Work for the course will include the preparation of drawings and models as well as practical experience in the theatre.
Prereq: DRAMA 244

DRAMA 332 W 3LD 0.5
Design for the Theatre 2
An extension of the studies described in DRAMA 331, concentrating on the practicalities of set design.
Prereq: DRAMA 331

DRAMA 341 F 4L 0.5
Lighting Design for the Theatre 1
An introduction to the theory and practice of theatre lighting design through studio experience.
Prereq: DRAMA 244

DRAMA 342 W 4L 0.5
Lighting Design for the Theatre 2
Advanced studies in theatre lighting design, including major production experience.
Prereq: DRAMA 341

DRAMA 343 F 2L 2C 0.5
Theatre Technology 1
Advanced studies in the theory and practice of theatre technology, including an apprenticeship program.
Prereq: DRAMA 243 and 244

DRAMA 344 W 2L 2C 0.5
Theatre Technology 2
A continuation of the studies described in DRAMA 343.
Prereq: DRAMA 343

DRAMA 348 3C 0.5
Arts Administration 1
An introduction to the problems and techniques of arts administration. Topics include: budgeting, program selection, fund raising, publicity and audience analysis.

DRAMA 349 3C 0.5
Arts Administration 2
An extension of the studies in DRAMA 348.

DRAMA 351 3C 0.5
Canadian Drama
See ENGLISH 316.
Cross-listed as ENGL 316

DRAMA 352 3C 0.5
Russian Drama
Cross-listed as RUSS 341

DRAMA 355 3C 0.5
German Drama
Cross-listed as GER 355

DRAMA 356 3C 0.5
The Stage as Forum: German Drama in Translation
Cross-listed as GER 356

DRAMA 357 3C 0.5
The Theatre of the Absurd

DRAMA 358 3C 0.5
Ancient Comedy in Translation
Cross-listed as CLAS 365

DRAMA 361 F std 0.5
Advanced Directing 1
Work as an assistant director on a major production involving the writing of a production casebook.
Prereq: DRAMA 261 or 262, at least three dramatic literature classes and permission.

DRAMA 362 W std 0.5
Advanced Directing 2
Students will be expected to form their own production company, mount a short play, and submit a detailed promptbook.
Prereq: DRAMA 361 and at least four dramatic literature classes.
DRAMA 371 3C 0.5  
Theatre History 1  
Theatre History from Classical Greece to the Renaissance.

DRAMA 372 3C 0.5  
Theatre History 2  
Theatre history from the Classical French and English Restoration periods to the present era.

DRAMA 406 A/B/C F std 0.5  
Theatre Workshop 1  
Participation in stage production for advanced students.  
Prereq: Permission of the play director and DRAMA 101A and B

DRAMA 407 A/B/C W std 0.5  
Theatre Workshop 2  
Participation in stage production for advanced students.  
Prereq: Permission of the play director and DRAMA 101A and B

DRAMA 409 W 3C 0.5  
Theatre Criticism  
Study and practice of the criticism of theatre production and performance.  
This course will not normally be taken until the student's final year.

DRAMA 421 F 6L 0.5  
Advanced Acting Workshop 1  
An intensive workshop designed to develop performance skills. Special attention given to individual acting problems.  
Prereq: DRAMA 321, 322, and permission of the instructor

DRAMA 422 W 6L 0.5  
Advanced Acting Workshop 2  
An extension of DRAMA 421.  
Prereq: DRAMA 421 and permission of the instructor

DRAMA 490 A-E F wkshp 0.5  
Selected Seminars in Drama and Theatre Arts  
Seminars in special areas of drama and theatre.  
Prereq: Permission of the department

DRAMA 49A/B F,W T 0.5/0.5  
Senior Seminar  
Open only to drama honours students in their fourth year. It is designed to give the student an opportunity to complete a comprehensive presentation in his or her major area of concentration.  
A letter grade for DRAMA 499A will be submitted only after the completion of DRAMA 499B.

COURSES NOT OFFERED 1987-88

Consult with Drama Undergraduate Officer to determine offerings for 1987-88

Department of Earth Sciences

Assistant Professors  
M. Coniglio, BSc (McGill), MSc (Manitoba), PhD (Memorial)  
S.K. Gleave, BSc, MSc, PhD (Queen's)  
D. Nobes, BSc, MSc, PhD (Toronto)

Research Professor  
J.A. Franklin, BSc (Eng)(London), MSc, D.I.C., PhD (Imperial College, London), PEng

Research Assistant Professors  
E.A. Sudicky, BSc, MSc, PhD (Waterloo), PEng  
B.G. Warner, BSc, MSc (Waterloo), PhD (Simon Fraser)

Adjunct Professors  
M.E. Brookfield, BSc (Edinburgh), PhD (Reading)  
R.M. Brown, BSc (Bishops), PhD (McGill)  
L.D. Delorme, BSc (Saskatchewan), MSc (Alberta), PhD (Saskatchewan)  
M. Gascoyne, BA, MSc (Lancaster), PhD (McMaster)  
D.R. Lee, BSc, MSc (North Dakota), PhD (Virginia Polytechnical Institute)  
R.W. Macqueen, BA, MA (Toronto), PhD (Princeton)  
J.O. Nriagu, BSc (Ibadan), MSc (Wisconsin), PhD (Toronto)  
F.A. Prantl, BSc, MSc, PhD (Innsbruck)  
H.C. Saunders, BA (Queen's Belfast), MA, PhD (Toronto)  
L.R. Snowton, BSc (Calgary), PhD (Houston)  
G. van der Kamp, BSc (British Columbia), PhD (Amsterdam)  
O. White, BSc, MSc (Toronto), PhD (Illinois), PEng

Senior Demonstrators  
J.L. Lang, BSc, MBA (Queen's)  
K. LaHay, BSc, MSc (Guelph)

Faculty Members holding cross appointments from Earth Sciences to:  
1Civil Engineering  
2Faculty Member holding joint appointment with Physics
Course Descriptions

Introductory Notes

1. EARTH 121/122 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 $50-$100 per student.

3. Regular Earth Sciences students are encouraged to seek geological employment in the summers.

EARTH 121 F 2C,3L 0.5
Introductory Geology 1
An introduction to rocks and minerals and the processes of their formation. The structure of the earth, plate tectonics and its relationship to deformation, metamorphism and formation of magmas. Earth resources.

EARTH 122 W 2C,3L 0.5
Introductory Geology 2
An introduction to processes that shape the earth’s landscapes. Consideration of the time concept in geology. Introduction to fossils, their occurrence and uses in earth sciences. The geological history of North America.

Prereq: EARTH 121

EARTH 221 W,S 3C,1T 0.5
Geochemistry 1

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 121

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. Stratigraphy in earth history and economic deposits.

Prereq: EARTH 121/122

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 121/122

EARTH 238 W,S 2C,3L 0.5
Introductory Structural Geology

Prereq: EARTH 121/122

EARTH 260 F 3C,2L 0.5
Applied Geophysics 1
An introduction to seismic, gravity, electric, electromagnetic and magnetic methods of exploration geophysics.

Prereq: PHYS 111/112 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. Magma differentiation; distribution and occurrence of magma types.

Prereq: EARTH 231, 232

EARTH 332 W 2C,3L 0.5
Metamorphic Petrology

Prereq: EARTH 232

For Honours Earth Science and Geological Engineering students only.

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

EARTH 336 F 2C,3L 0.5
Paleontology
Advanced paleontology emphasizing morphology, classification, evolution, paleoecology and stratigraphic value of fossil invertebrates. Laboratory study of fossil collections.

Prereq: EARTH 126

EARTH 342 F 2C,3L 0.5
Geomorphology

Antireq: GECG 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 rocks and fossil regional suites and geological maps.

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: MATH 113A/B and an introductory course in computer programming

EARTH 358 W 3C,1T 0.5
Environmental Geology
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 Sciences

EARTH 380A W 3C 0.5
Global Geophysics
Topics in the plate tectonics, heat flow, gravity, seismology, magnetics, electromagnetics and dynamics of the planet. 
Prereq: PHYS 121/122, EARTH 260
Offered every other year alternating with EARTH 400.

EARTH 396 F 2C 0.5
Geophysics 1
Prereq: MATH 113A/B, PHYS 121/122 or equivalent
Cross-listed as PHYS 368

EARTH 398 W 3C 0.5
Geophysics 2
The geology of the ocean basins. Topics in physical oceanography. Physical properties of ocean water, heat budget of the world oceans. Oceanic circulation, Coriolis effects. Some idealized current regimes. 
Prereq: MATH 113A/B and PHYS 121/122 or equivalent
Cross-listed as PHYS 369

EARTH 370 W 3C,2L 0.5
Economic Geology
The occurrence and geological setting of metallic, non-metallic minerals and construction materials. Energy resources. Special emphasis on Canada's resource industries. The laboratory will involve sampling methods, ore calculation and property evaluation. 
Prereq: EARTH 231, 232

EARTH 390 W field trip
Methods in Geological Mapping
Ten day field camp at Whitefish Falls, held at beginning of spring term.

EARTH 421 F 2C,3L 0.5
Geology 1
The application of chemical thermodynamics to geochanical problems. Development of the three laws of Thermodynamics; Gibbs free energy and equilibria constants. Introduction to various topics in aqueous geochemistry such as mineral equilibria, ion exchange and redox equilibria. Various aspects of organic geochemistry and geochemical exploration will also be covered. 
Prereq: First year chemistry, EARTH 221
Restricted to fourth year and graduate students.

EARTH 427 W 2C,3S 0.5
Crustal Evolution
An analytical critique of the plate tectonics theory. Tectonic syntheses based on the theory in the light of world geology. Normally restricted to fourth year Earth Sciences students.

EARTH 432 F 3C,2L 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 336

EARTH 434 W 2C,3S 0.5
Biostatigraphy
Methods of using paleontological data to solve stratigraphic problems. Fossil and rare 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 macroscopic 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 stress and strain. Mohr's circle, strength theories, laboratory tests, classification of rocks. Rock mechanics considerations in the construction of shafts, drifts, tunnels, foundations and rock slopes. Laboratory exercises will deal with uniaxial, triaxial, flexure, hardness and tensile testing of rock. Problems 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,3W 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. 
Antireq: for students majoring in Earth Sciences; GEOG 300 and GEOG 401
Not to be taken by third year students.

EARTH 456 F, S 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 the physical side of 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. 
Prereq: EARTH 121/122 or GEO E 126 or CIV E 253, and MATH 213A/B or equivalents.
Formerly EARTH 439
EARTH 459 W 3C, 1T 0.5

**Chemical Hydrogeology**

An introduction to the chemical side of hydrogeology with emphasis on ground-water quality and contaminants in the groundwater zone, the geochemical origin of major ions in natural ground-water, causes of hardness, groundwater age determination using isotopes, common causes of ground-water contamination, processes governing contaminant behaviour including dispersion, diffusion and adsorption, hydrogeologic aspects of site selection for waste disposal.

Prereq: EARTH 221 or CIV E 375 or equivalent, and EARTH 458

Formerly EARTH 490

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EARTH 480 W 3C, 1T 0.5

**Applied Geophysics 2**

A detailed examination of selected topics in exploration geophysics, with an emphasis on data processing and computer modelling of geophysical responses.

Prereq: EARTH 260 and an introductory course in computer programming. Offered every other year alternating with EARTH 360A

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EARTH 481 F 2C, 3L 0.5

**Applied Geophysics 3**

Geophysical field methods for Engineering and Hydrogeology. Prereq: Students must be enrolled in the Geophysics Option

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EARTH 470 F 3C, 2L 0.5

**Metallic Mineral Deposits**

The petrology and genesis of metallic 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

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EARTH 490 S S 2L 0.5

**Field Study**

Depending on the demand and the availability of an instructor, a six week field course may be offered in an area of unusual geological interest during the spring or summer. This course will consist of two weeks of classroom lectures and one month in the field location. Field trips are to be paid by the student.

Prereq: Consent of the instructor

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**Department of Economics**

**Associate Professor, Chairman**

K.M. Bennett, BA, MA (Queen's), PhD (McGill)

Professor, Associate Chairman

D. Wilton, BComm (McMaster), PhD (MIT)

Associate Professor, Graduate Officer

L.P. Fletcher, BComm (Mount Allison), AM, PhD (Brown)

Lecturer, Undergraduate Officer

E.W. Lau, BA (Toronto), MA (Manchester)

Professors

S.K. Ghost, BSc, MSc (Calcutta), MS, PhD (Wisconsin)

J.H. Hotson, BA (Colorado College), MA, PhD (Pennsylvania)

R.R. Kerlon, BComm (Toronto), MA (Carleton), PhD (Duke)

L. Needeman, MA (Oxford), PhD (Glasgow)

W.R. Thirsk, BA (British Columbia), MA, PhD (Yale), (on leave 1987)

Associate Professors

A.A. Andrikopoulos, BA (Athens), MA (Wayne State), PhD (Southern California)

J.A. Brox, BA (Toronto), MA, PhD (McMaster)

J.E. Cuenca, LIC (Madrid), MA (Western Michigan), PhD (Toronto)

M.C. Howard, BA, MA (Lancaster), PhD (Leicester)

S.W. Kardasz, BA (Loyola), PhD (Queen's)

R.C. Kumar, BStat, MStat (Indian Statistical Institute), MA, PhD (Toronto)

F.M. Naqib, BSc (Washington), MSoc (Oregon), PhD (Queen's)

W.R. Needham, BComm (Carleton), MA, PhD (Queen's)

K.R. Stottery, BA (Southern California), MA, PhD (Queen's)

Assistant Professors

R.A. Andrikovitch, BSc (Lethbridge), MA, PhD (Western Ontario)

R.W. Bodell, BSc (Sydney, Australia), MA, PhD (York)

F. Carvalho, BA, MA, PhD (Waterloo)

T.T. Nguyen, BSc, ChE (California-Berkeley), MA (Simon Fraser), PhD (Western Ontario)

E. Nosal, BA (Queen's), MA (McMaster), PhD (Queen's)

Lecturers

H. Cutts, BA (Queen's), MA (Princeton)

C. Fader, BA (Windsor), MA (Western Ontario)

G. Stirling, BMath (Waterloo), MA (Guelph)

Adjunct Lecturers

R.F. Kimminik, BA (Waterloo), MBA (McMaster)

L. Smith, BA (Waterloo), MA (Waterloo)

Faculty Member of Economics holding a cross appointment to:

Accounting

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**Course Descriptions**

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 "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 courses may be offered in the spring term from time to time. Consult departmental listing at time of preregistration.
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.

ECON 102 F,W,S 3C 0.5
Introduction to Macroeconomics
Determination of national income; the banking system; government fiscal and monetary policy; international trade and finance; and current economic problems.

ECON 201 F,W,S 3C 0.5
Microeconomic Theory
Theory of consumer choice; the economics of production; pricing and output under perfect and imperfect competition.
Pre req: ECON 101

ECON 202 F,W,S 3C 0.5
Macroeconomic Theory
Theory of the determination of the level of national income (GNP), the unemployment rate, interest rates, prices and inflation; analysis of macroeconomic policies to stabilize the economy and alleviate the problems of inflation and unemployment.
Pre req: ECON 101, 102

ECON 211 F 3C 0.5
Mathematics of Economists
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.
Pre req: ECON 101, 102
Students who have not taken Grade 13 Algebra and Calculus are strongly advised to take MATH 104.

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, statistical estimation, hypothesis testing and regression analysis.
Pre req: 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.
Pre req: ECON 101, 102

ECON 241 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.
Pre req: ECON 201

ECON 263 W 3C 0.5
History of Canadian Economic Development
A study of the economic development of Canada: development theories, industrial structure and national policies analyzed in a Classical-Marxian framework.
Pre req: ECON 101, 102

ECON 301 F,W 3C 0.5
Intermediate Microeconomics
Theory of modern welfare economics with some applications; the meaning and measurement of economic efficiency and equity and their relationship to economic welfare.
Pre req: 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.
Pre req: ECON 201, 202, 231

ECON 311 F,W 3C 0.5
Introduction to Mathematical Economics
Mathematical treatment of some micro- and macro-partial and general equilibrium models: programming and other techniques; simple growth models.
Pre req: ECON 201, 202, 211 (or MATH 1306)
Strongly recommended for students who intend to do graduate work in Economics.

ECON 321 F,W 3C 0.5
Introduction to Econometrics
Introductory level course in econometrics includes economic model building and testing, regression and correlation analysis, and price indices.
Pre req: ECON 221

ECON 331 F,W 3C 0.5
International Trade and Finance
An examination of theories of international trade and finance at an intermediate level. Topics include theories of trade structure (Ricardian, Heckscher-Ohlin), the effects of tariffs and multinational corporation behaviours, and adjustment under flexible and fixed exchange rates.
Pre req: ECON 201, 231

ECON 333 W 3C 0.5
Interregional Economics
An examination of structural characteristics, development and growth in intersystems. Integration of economic and spatial analysis related to theory and policy through a focus on models such as neoclassical, export-base, shift-share, stages, cumulative-causation, central-place and core-periphery.
Pre req: 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.
Pre req: ECON 201, 202, 231

ECON 341 F,W 3C 0.5
Public Finance
The economic rationale of governmental fiscal activity; cost-benefit analysis; the structure and economic effects of public expenditure and revenues; the analysis of income, consumption and wealth taxes.
Pre req: 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.
Pre req: 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.
Pre req: 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 102 is recommended

ECON 353 F 3C 0.5
Population Economics
Population objectives; demographic techniques; economic interrelationships with fertility, mortality and migration; determinants and consequences of current world population changes.
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 241 is recommended.)

ECON 363/364 W 3C 0.5/0.5
Contemporary Canadian Problems 1,2
A "topic oriented" seminar course. Problems are selected from a list that includes regulatory economics, poverty, unemployment, industrial policy, safety and so forth. 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 367-389 W 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,S 3C 0.5
Advanced Microeconomic Theory
This course considers a number of advanced topics at the forefront on modern microeconomics. Such areas may include different forms of general equilibrium analysis, the microfoundations of macroeconomics, the treatment of uncertainty in economics.
Prereq: ECON 221, 301, 302
Preference for admission will be given to fourth-year Honours students. Consent of the instructor or undergraduate officer required for other students.

ECON 402 F,W 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, 221, 301, 302 and permission of the instructor or undergraduate officer for all students who are not registered in the 4th 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, and so forth.
Prereq: ECON 301, 302, 321

ECON 404 W 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 F 3S 0.5
Keynes and Post Keynesian Economics
This course draws on Keynes, Fisher, Kalecki, Wintreba, 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 General and Honours students. However, M.A. 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 421/422 F,W 3C 0.5/0.5
Econometrics 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 economies 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, 331

ECON 461 F 3S 0.5
Comparative Economic Systems
This course concentrates upon the systems 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

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.
**Department of Electrical Engineering**

**Professor, Chairman of the Department**

J.W. Mark, BSc (Toronto), MEng, PhD (McMaster), PEng

**Professor, Acting Dean of Graduate Studies**

L.A.K. Watt, BSc (Manitoba), MS (Chicago), PhD (Minnesota)

**Professor, Associate Dean, Undergraduate Studies, Faculty of Engineering**

H.C. Ratz, BSc (Toronto), MS (Massachusetts Institute of Technology), PhD (Saskatchewan), PEng

**Professor, Associate Chairman for Graduate Affairs**

J.D. Aplevich, BE (Saskatchewan), PhD (Imperial College, London), PEng

**Professor, Associate Chairman for Undergraduate Affairs; Director, Computer Communications Networks Group**

J.A. Field, BE (Saskatchewan), MASC, PhD (Toronto), PEng

**Professors**

I.F. Blake, BSc, MSc (Queen's), MA, PhD (Princeton), PEng

P.R. Bryant, MSc (London), MA, PhD (Cambridge)

S.G. Chamberlain, MSc, PhD (Southampton)

Y.L. Chow, BE (McGill), MASC, PhD (Toronto), PEng

J.D. Cross, BSc (Wales), MS, PhD (Carleton), PEng

M.I. Elmasry, BSc ( Cairo), MASC, PhD (Ottawa), PEng

J.V. Hanson, BSc (Toronto), MASC, PhD (Imperial College, London)

E.L. Heasall, BSc, PhD (Imperial College, London), PEng

S.N. Karna, BSc (Punjab), MS, PhD (Illinois), PEng

R.H. MacPhie, BSc (Toronto), MS, PhD (Illinois)

V.H. Quintana, BE (Chile), MSc (Wisconsin), PhD (Toronto), PEng

R.S. Ramshaw, BSc, PhD (Nottingham), PEng

J. Reeve, BSc, MSc, PhD, DSc (Manchester), PEng

D.J. Routon, BSc (Belfast), PhD (Imperial College, London), PEng

**Associate Professors**

R.G. van Herenwijk, Jr (Delft, Holland), PEng

M. Vidyasagar, BSc, MASc, PhD (Wisconsin)

T.R. Viswanathan, BSc (Madras), MSc, PhD (Toronto), PEng

J. Vlach, Dip Ing CSc (Technical University of Prague)

J.W. Wong, PhD (California-Los Angeles)

**Assistant Professors**

S.K. Chaudhuri, PhD (Manitoba)

P.P. Dasiwicz, BSc, MSc, PhD, (Waterloo), PEng

J.S. Keeler, BSc, MASc. (Toronto), PEng

W.M. Loucks, BSc (Waterloo), MASC. PhD (Toronto), PEng

F. Mavaddat, BSc (Tehran), Diploma (Netherlands), PhD (Imperial College), DSc

R.E. Sevior, Dipl. Ing (Czech Technical University), PhD (Toronto), PEng

W.J. Wilson, BE, MSc (Saskatchewan), PhD (Cambridge), PEng

**Adjunct Faculty**

R.G. Anthes, BSc, MSc, MASc (Toronto), PEng

R. Bartnikas, BSc (Toronto), MEng, PhD (McGill)

J. Lit, BSc, DipEd (Hong Kong), DSc (Liverpool)

R. Malewski, BSc, MSc, PhD (Technical University of Warsaw), PhD (Electrotechnical Institute of Warsaw)

L.Y. Wei, BS (National Northwestern College, China), MSc, PhD (Illinois)

**Laboratory Director**

R.L. Wright, PEng

Faculty Member of Electrical Engineering holding cross appointment to: 1Computer Science

Faculty Members holding cross appointment to Electrical Engineering from: 2Computer Science

3Physics, Wilfrid Laurier University
Course Descriptions

EL E 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; circuit functions and analysis techniques.  
1Alternate weeks.

EL E 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.  
1Alternate weeks.

EL E 201  F,W  1C  0.0  
**Seminar**  
General Seminar

EL E 202  F,S  1C  0.0  
**Seminar**  
General Seminar

EL E 205  F,W  3C,1T  0.5  
**Advanced Calculus for Electrical Engineers 1**  
Fourier Series; Ordinary differential equations; Laplace transforms; applications to linear electrical systems.  
Cross-listed as MATH 211

EL E 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

EL E 208  W  3C,1T,3L  0.5  
**Electronic Circuit Analysis**  
This is an introductory course in electronic circuit analysis which follows the first circuits course EL E 123. The topics to be discussed are: Operational amplifier applications, diodes, rectifiers, introduction to MOS and bipolar transistors, basic amplifier circuits, frequency response, elementary treatments of feedback, filters and oscillators. The student is introduced to computer-aided analysis techniques using WATAND.  
Prereq: EL E 123 or equivalent  
1Alternate weeks.

EL E 222  F,W  3C,1T,3L  0.5  
**Digital Computers**  
Prereq: GEN E 121 or equivalent  
Open

EL E 224  F,S  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-numeric algorithm (e.g. sorting). Emphasis will be placed on algorithm development and programming style.  
Prereq: GEN E 121 or equivalent  
1Open

EL E 231  F  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: PHY 125 or equivalent  
1Alternate weeks.

EL E 234  F  3C,1T,3L  0.5  
**Microelectronic Circuits and Devices 1**  
The first of a two course sequence in electronic circuits and devices. Topics covered are: second order networks, operational amplifiers, electronic devices, analog and digital circuits.  
Prereq: EL E 123  
1Alternate weeks

EL E 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  
1Project

EL E 252  S  3C,1T,3L  0.5  
**Data Structures**  
Introduction to data and data abstraction, fundamental data structures, implementing and manipulating data structures, basic file systems.  
Prereq: EL E 251  
1Project

EL E 261  W  3C,1T,3L  0.5  
**Energy Systems and Components 1**  
1Alternate weeks.

EL E 262  F  3C,1T,3L  0.5  
**Energy Systems and Components 2**  
Principles of electromechanical energy conversion. Methods and control of rotating machines. DC and AC induction motors. Synchronous machines.  
Prereq: EL E 261  
1Alternate weeks

EL E 269  F,W  3C,2T,3L  0.5  
**Electrical Engineering 2**  
1Alternate weeks.  
For Mechanical Engineering students only.
Introduction to digital circuits.

Oscillators; noise in electronic circuits; considerations. Hardwired and micropro.

Introduction to large signal amplifiers:

Hybrid-pi model: high and low frequency multi-stage small-signal amplifiers, the

Electronic Circuit

grammed controllers. Semiconductor effects; negative feedback amplifiers;

Switching algebra. Simplification of

and demodulation of FM signals. Intro-

EL E 332 W, S 3C, T, 3L 0.5

Microelectronic Circuits and Devices 2

The second of a two course sequence in electronic circuits and devices. Topics covered are: device physics and models, transistor amplifier, feedback, filters and oscillators, logic circuits, memory circuits.

Prereq: EL E 234

Antireq: EL E 322

*Alternate weeks

EL E 342 W, S 3C, T 0.5

Electrical Networks 1


Prereq: EL E 222, EL E 251, EL E 323

*Alternate weeks

EL E 353 W 3C, T, 3L 0.5

Microprocessor Systems and Interfacing

Microprocessor system architecture, buses, memories, peripheral connections, parallel, serial, analog interfaces, magnetic storage media, data communications, testing and debugging.

Prereq: EL E 222, EL E 251, EL E 323

*Alternate weeks

EL E 354 W 3C, 3L 0.5

Real-Time Operating Systems

Introduction, basic concepts, process management, interprocess communication and synchronization, memory management, resource management, interrupt handling, concurrent programming.

Prereq: EL E 225, EL E 252

*Project

EL E 360 F 3C, T 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: EL E 371 S 3C, T, 3L 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: EL E 126 or equivalent

*Alternate weeks

EL E 380 F, W 3C, T, 3L 0.5

Systems and Control


*Alternate weeks

EL E 401 F, S 1C 0.0

Seminar

General Seminar

EL E 402 W 1C 0.0

Seminar

General Seminar

EL E 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

EL E 408 W 3C, 3L 0.5

Robot Dynamics and Control


Prereq: Permission of the instructor

EL E 411 F, S 3C, T 0.5

Data Communications


Prereq: EL E 319, EL E 316 or by permission of instructor
EL E 412 W 3C,1T 0.5
Digital Communications
Representation of signals, gaussian processes, optimum receiver, equivalent signal sets, non-white channel noise, maximum likelihood and minimax receiver. Information and its measure, source encoding, error-free communication, channel capacity. Error-correcting codes: linear block codes, cyclic codes, convolution codes.
Prereq: EL E 411 or permission of instructor

EL E 413 W 3C,1T 0.5
Digital Signal Processing
Discrete systems for signal processing, in particular linear filtering, are rapidly replacing analog forms. This course serves as an introduction to the analysis and design of linear, time invariant discrete systems, with both software and hardware implementations.

EL E 426 F 3C,1T,3L 0.5
Software Engineering
Block structured languages, actual and formal parameters, recursion, formal description, relationship to machine code. Compilers. Data structures, arrays, lists, stacks, associate structures. Searching and sorting. Operating system organization, co-operating processes, process synchronization primitives. Structured software design, software testing and maintenance.
Prereq: EL E 222 or equivalent

EL E 427 F,W 2C,1T,3L 0.5
Digital Systems Engineering
Prereq: EL E 323 and either EL E 354, EL E 426 or CS 354 or equivalent

EL E 428 F,S 3C,1T 0.5
Computer Communications Networks
Prereq: EL E 222, EL E 316, EL E 318

EL E 435 F,S 3C,1T 0.5
Semiconductor Devices
Metal-Semiconductor junctions (Schottky barriers), heterojunctions, solar cell, light emitting diode, photodetector diode, JFETs, MESFETs, MOSFETs, VLSI devices, Power devices (SCRs, power switching transistors, PIN rectifier diodes).

EL E 436 W 2C,1T,3L 0.5
Design of Integrated Circuits and Devices
Design and process details of discrete bipolar, JFET and MOSFET devices. Design and implementation of VHSIC and VLSI digital and analog integrated circuits. Process, device and circuit CAD.
Project

EL E 437 W 2C,1T,3L 0.5
Integrated VLSI Systems
Integrated system design, memory cells and systems, logic arrays, VLSI design methodologies, applications in digital signal and data processing systems.
Project

EL E 438 F,S 2C,1T,3L 0.5
Switching and Digital Circuits
Switching characteristics of semiconductor devices, non-sinusoidal wave generation and shaping, comparators, digital integrated circuits, including ECL, TTL, PL, STL, MOS, CMOS.

EL E 439 W 2C,1T,3L 0.5
Analog Electronic Circuits
Project

EL E 443 W 2C,1T,3L 0.5
Electrical Networks 2
Topics from the following: two-port descriptions of ideal devices, including operational amplifiers; network functions, formulation and solution of network equations; sensitivity calculations in the frequency domain; active network analysis; simple filter design; time domain solutions; simulation; introduction to digital and switched capacitor networks; computer-aided analysis and design of networks.
Prereq: EL E 342 or equivalent

EL E 446 F,S 3C,1T 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 decomposition, system realization. The necessary matrix and linear-algebra theory is developed as required.

EL E 455 S 3C,1T,3L 0.5
Database Systems
Introduction, data models, file systems, database system architectures, query languages, integrity and security, database design.
Prereq: EL E 251, EL E 252
Project

EL E 456 S 3C,1T 0.5
Software Engineering
Requirement analysis, specifications, software design, software development environments, testing, software project management, quality assurance and control.
Prereq: EL E 364
Coreq: EL E 455

EL E 459 W 2C,1T,3L 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.
Every third week.

EL E 463 F,S 2C,1T,3L 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.
Project
EL E 464 W 3C,3L 0.5
High Voltage and Insulation Engineering
Nature and origin of high voltage surges encountered on power systems. Travel-
ling waves on transmission systems; insulation engineering, electrostatic fields in
high voltage apparatus, insulation failure; corona; insulation testing, circuit breakers
and surge protection devices; insulation coordination.
1Alternate weeks.

EL E 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, trans-
formers 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.

EL E 473 W 2C,1T,3L 0.5
Microwave Engineering
Review of Maxwell’s equations, rectangular and circular waveguide, microwave
circuits, scattering matrix theory, microwave filters, simple waveguide disconti-
nuities, klystrons and magnetrons.
Prereq: EL E 371 or equivalent
1Every third week.

EL E 474 F,S 2C,1T,3L 0.5
Antenna Engineering
An introduction to the theory of radiation and of antenna and propagation engi-
neering; linear antennas, linear arrays, aperture antennas, frequency inde-
dependent antennas, measurement theory.
Prereq: EL E 371 or equivalent
1Every third week.

EL E 475 W 3C,1T,3L 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 wave guiding 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 telecommu-
nication systems; system design
considerations, fibre characteristics, source and detector characteristics.
Prereq: EL E 371 or equivalent
1Project

EL E 481 F,S 2C,1T,3L 0.5
Design of Analog and Digital Control Systems
Review of performance specifications for design. Design of analog control systems
using transfer functions. Analysis of discrete-time systems using the
z-transform. Sampled data systems. Design of digital control systems using
transform techniques.
1Alternate weeks

EL E 482 W 2C,1T,3L 0.5
Multivariable Control Systems
Review of multivariable state space methods with emphasis on control applica-
tions. Performance indices and optimal control. Continuous and discrete state
feedback control of linear systems. Systems with inaccessible states.
Stability analysis.
Prereq: EL E 446, EL E 481
1Open lab.

EL E 485 W 2C,1T,3L 0.5
Computer Control Applications
Realization of digital controllers: digital-analog equivalences, sampling and quan-
tization effects, fixed-point arithmetic
realizations. Real-time computer inter-
facing: hardware and programming
considerations. Modeling and simulation of processes for control design applica-
tions. Detailed study of an example applic-
ation.
Prereq: EL E 426, EL E 481
1Project.

EL E 499A F 9L 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. For a one term project, a short progress report 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.

EL E 499B W 9L 0.5
Project
Either a continuation of EL E 499A or a separate one-term project.

COURSES NOT OFFERED 1987-88

EL E 498 Project

Department of English

Associate Professor, Chairman of Department
G.E. Sletthaug, BA (Pacific Lutheran), MA, PhD (Nebraska)

Associate Professor, Associate Chairman and Graduate Officer
H.M. Logan, AB (Franklin and Marshall), PhD (Pennsylvania)

Associate Professor, Associate Chairman and Undergraduate Officer
J.S. North, BA, MA (British Columbia), PhD (Alberta)

Professor Emeritus
G.R. Hibbard, BA, MA (London), D Litt (Waterloo)

Professors
L.A. Cummings, AB (Washington), AM (Missouri), PhD (Washington), Recip-
ient of the OCIFA (Ontario) Teaching Award

J. Gold, BA (Birmingham), PhD (Wisconsin)

J.C. Gray, BA (Washington State), MA (Connecticut), PhD (Syracuse)

K.L. Ledbetter, AB (Central College, Mo.), MA, PhD (Illinois), Recipient of the
Distinguished Teacher Award

C.F. MacRae, BA (Western Ontario), MA (McMaster), PhD (Toronto), (Retired) *

W.R. Martin, BA, MA, D Litt 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)

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)

H.B. Ellis, BA (Rollins), MA, PhD (Illinois)

S. Fogel, BA (Carleton), MA (British Columbia), PhD (Purdue) J

R.N. Goossens, BA (Kansae), MA, PhD (Colorado)

P.M. Hinchcliffe, BA (British Columbia), MA, PhD (Toronto) J

N.C. Hultin, BA (Concordia), MA (Chicago), PhD (Johns Hopkins)

D.R. Letson, BA (Waterloo), MA (McMaster), PhD (Toronto) J, Recip-
ient of the Distinguished Teacher Award
Course Descriptions

English

R. Lister, BA, MA, PhD (Toronto)
W.R. Macnaughton, BA (Toronto), MA, PhD (Wisconsin)
E.P. McCormack, MA (Glasgow), PhD (Manitoba) J
C.E. McGee, BA, MA, PhD (Toronto), J
S.E. McMillan, BA, MA (Carleton), PhD (Dalhousie)
E.F. Shields, AB (Chestnut Hill), MA (Villanova), PhD (Illinois)

J.S. Stone, BA, MA (British Columbia), (Retired)*

Assistant Professors
M.A. Gerhardstein, BA, MA (Montana), PhD (Iowa)
M. Liggina, BA (St. Francis Xavier), MA, PhD (York), J
A.L. Magnusson, BA (Manitoba), MA, PhD (Toronto)
J. Miller, BA, BLS (McGill), MA, MPhil (Waterloo), PhD (York), R
N.F. Randall, BA (Guelph), MA (Waterloo), PhD (York)
P. Saunders, BA (Pace), MA, PhD (Toronto)
J. Segal, BA (McGill), MA, PhD (British Columbia)

Adjunct Faculty
C. Redmond, BA (Queen’s), MA (Waterloo)

Lecturers
L. Dorney, BA, MA (Louisville), J (Part-time)

Faculty Members holding cross appointments to English from:
1. Architecture
2. Faculty of Arts

* Also has Adjunct appointment

J refers to faculty members at St. Jerome’s College
R refers to faculty members at Renison College

Course Descriptions

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. W.K. Thomas’s Correct Form in Essay Writing is the official style sheet for all undergraduate English courses.

3. The “normal” number of lectures per week in each course is three; however, instructors determine how often their particular class will meet.

4. In all English courses, emphasis will be placed on student essays written in connection with the reading.

Most courses are also taught at St. Jerome’s College

‘R’ courses are administered by Renison College.

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 129R 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, 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.

ENGL 109 F.W.S 0.5
Introduction to Essay Writing 1

The course teaches the construction of the expository essay, with attention to the structure of good paragraphs, to 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.
ENGL 151 W 0.5
English as an Instrument of Thought and Communication
A continuation of ENGL 150. From a basis of simple semantics and elementary logic, students will proceed to examine more complex language in fiction and other forms of literature. About six written exercises are assigned.
Prereq: ENGL 150

ENGL 24OR F 0.5
Form and Function 1
The uses of literacy and the functions of language as acquired in ENGL 140R/141R. These will be applied to the more advanced form of the literary and critical assignment essay, involving comparison, evaluation, and exposition.

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.

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.

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 F,W,S 0.5
20th-Century Literature in English, 1900-30
A close examination of a representative selection of works by major authors writing in English such as W.B. Yeats, Virginia Woolf, D.H. Lawrence, T.S. Eliot, and Ernest Hemingway.

ENGL 105B W 0.5
20th-Century Literature in English, 1930-80
A continuation of ENGL 105A. A close examination of a representative selection of works by major authors writing in English such as William Faulkner, Dylan Thomas, and Margaret Laurence.
Prereq: ENGL 105A or consent of instructor

ENGL 106A 0.5
The Hero
A study of human excellence in thought and action embodied in representative men and women, as seen through works of literature.

ENGL 106B 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 106C 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 106H 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 106M 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 106N 0.5
The Wars
Studies the experience of war and attitudes toward it as revealed in literary works from different historical periods.

ENGL 190 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.

ENGL 200B W,S 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.

ENGL 201 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 202A 0.5
The Bible and Literature 1
The study of major themes, stones, and literary characteristics of the King James Bible (Hebrew Scripture) and their influence on English literature.

ENGL 202B 0.5
The Bible and Literature 2
The study of major themes, stones, and literary characteristics of the King James Bible (Christian Scripture) and their influence on English literature.
Prereq: ENGL 202A or consent of instructor

ENGL 203 0.5
Introduction to Folklore 1
An introduction to the scope and aims of folklore, together with a survey of the major types of folklore in the English tradition from nations of the English-speaking world. Topics such as oral literature, myth, legend, tale, and marchen will be discussed.
ENGL 204 0.5
Introduction to Folklore 2
Similar to 203 but dealing with folklore, ballads, songs, medicines, riddles, chants, proverbs, and charms.

ENGL 208R F.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 208A 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 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 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 Thurbler will be studied.

ENGL 208D 0.5
Modern Satire
The mode of satire in the fiction, drama, poetry, and discourse of the 20th century. Particular attention to the literary works of Waugh, Huxley, Orwell, Parker, Heiler, Heiber, and a dramatist of the absurd, but also attention to satiric cartoons and nightclub satire.

ENGL 208E 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 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 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 Le Carré will be discussed. The course includes the examination of critical approaches to the form of detective fiction.

ENGL 208Q 0.5
Ordered Chaos: The Apocalyptic Vision in Literature
A study of dehumanized worlds in fiction that can be called "apocalyptic." Works by such writers as St. John the Divine, Shakespeare, Mary Shelley, Aldous Huxley, Mordecai Richler, and Kurt Vonnegut will be studied.

ENGL 209 0.5
Writing Strategies
Students practise 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.

ENGL 210 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 the techniques of editing and presentation. Some practice in oral presentation.

ENGL 210C 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.

ENGL 211 F 0.5
The Novel 1
The study of the novel written in English from its beginnings to the late 19th century.

ENGL 212 W 0.5
The Novel 2
The study of the novel written in English from the late 19th century to the present.

ENGL 214 0.5
Themes in Canadian Literature
The course will survey a theme which is significant to the understanding of the Canadian literary mind. Topics will vary from section to section.

ENGL 219 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.

ENGL 220 0.5
The Development of Drama to 1660
A study of the origins and development of English drama, with special concentration on 16th-century non-Shakespearean drama.

ENGL 232 0.5
Drama from 1660
A study of the principal playwrights, plays, and movements in dramatic history from the re-opening of the theatres in 1660 to the present day.

ENGL 233 0.5
Drama from 1560
A study of the principal playwrights, plays, and movements in dramatic history from the re-opening of the theatres in 1660 to the present day.

ENGL 234 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.

ENGL 235 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 the techniques of editing and presentation. Some practice in oral presentation.

ENGL 236 0.5
Writing Strategies
Students practise 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.

ENGL 237 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.
ENGL 251A F 0.5
The Practice and Theory of Criticism 1
The study and practice of skills needed for a close, analytical reading of literary texts and for the writing of critical analyses on them; studies of theories concerning literature and literary criticism.

Prereq: ENGL 251A (See above)
Formerly ENGL 375A

ENGL 251B W,S 0.5
The Practice and Theory of Criticism 2
The continuation of ENGL 251A (See above)
Formerly ENGL 375B

ENGL 305A 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 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
English Language and Linguistics
A study of basic linguistic principles and concepts, historical and formal.
Formerly ENGL 373 and ENGL 375

ENGL 306A 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

ENGL 306B 0.5
Modern English Grammar
Introduction to modern English grammar and structure—its meaningful forms and syntax. Several methods of analysis will be employed and evaluated, including the traditional, structural, transformational-generative, and functional.
Prereq: ENGL 306A
Formerly ENGL 375B

ENGL 306C 0.5
Historical Linguistics
Introduction to historical reconstruction and comparative analysis. Basic phonological, morphological, syntactic changes as they manifest themselves in language will be examined.
Prereq: ENGL 306A
Formerly ENGL 373A

ENGL 306D 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
Formerly ENGL 373B

ENGL 306E 0.5
Linguistics and Literatures
A study of linguistics and its applications in analyzing the style and language of literature. Topics include the relationship between the structure of language and literature, speech and writing, speech acts and genres, discourse and text.

ENGL 309A 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

ENGL 309B 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

ENGL 309C 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

ENGL 309D 0.5
Approaches to Style
Theories of style and approaches to the stylistic analysis of both literary and non-literary texts. Students will consider contributions to the study of style from such areas as traditional stylistics, New Criticism, formalism, affective stylistics, speech act theory, discourse analysis, and sociolinguistics.
Prereq: Consent of instructor

ENGL 310A 0.5
Middle English 1

ENGL 310B 0.5
Middle English 2
A study of Chaucer's Canterbury Tales and related Middle English poems and prose.

ENGL 312 0.5
Literature of the Commonwealth
A survey of Australian poetry and prose, with some consideration of the literatures, in English, from Africa and the West Indies.

ENGL 313 0.5
Canadian Literature to 1920
A study of Canadian prose and verse to 1920, with particular attention to the poetry of the School of the Sixties and to the historical and idyllic novels of the 19th and early 20th centuries.

ENGL 314 0.5
Canadian Poetry Since 1920

ENGL 315 0.5
Canadian Prose Since 1920
The Canadian novel since the appearance of Morley Callaghan, with brief consideration of the essay and short story during the period.

ENGL 316 0.5
Canadian Drama
A study of plays by such dramatists as Merrill Denison, Robertson Davies, Gratien Gélinas (translation), James Reaney, John Coulter, George Ryga, and Michel Tremblay (in translation). Background for 20th-century drama will be provided in lectures.
Cross-listed as DRAMA 351

ENGL 325 0.5
Reading, Leisure, and Human Development
An introduction to the selection and application of literature in Counseling, Recreation, and community settings. Students will be offered theoretical and experiential instruction in a workshop-style seminar. Assignments will be approximately eight novels or anthologies. A bibliography will be provided. A term paper will be required.
ENGL 330A 0.5
Elizabethan Literature 1 (excluding Drama)
A study of the principal writers of prose and of lyric and narrative poetry in England during and immediately before the reign of Elizabeth I.

ENGL 330B 0.5
Elizabethan Literature 2 (excluding Drama)
A continuation of ENGL 330A. Reserved for special attention is Spenser’s epic poem glorifying England and Elizabeth I – The Faerie Queene.
Prereq: ENGL 330A is recommended

ENGL 335 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.

ENGL 336 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 0.5
American Literature
The meaning of America – the myth, the dream, and the reality – as experienced through its major literary works. Sin, guilt, madness, mysticism, and grace: the search for fulfillment and peace by such writers as Poe, Thoreau, Whitman, Twain, and Crane.

ENGL 344 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.
Prereq: ENGL 343 or consent of instructor

ENGL 345/346/347
Studies in American Literature
(Usually only one or two courses from this series are offered each year.)

ENGL 345B 0.5
American Fiction
The Southern Myth: its origins in early literature, its flowering and ruin, as seen by white and black writers, including Twain, Faulkner, Welty, Styron, Grau, O’Connor, Wright, and Ellison.
Prereq: ENGL 343 or consent of instructor

ENGL 346C 0.5
American Fiction
Special emphasis will be given to the works of two or three major American novelists such as Herman Melville and William Faulkner.
Prereq: ENGL 343 or consent of instructor

ENGL 347A 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 0.5
17th-Century Non-Dramatic Literature 1
A study of secular and religious lyric poetry by poets such as Donne, Jonson, Hemick, Herbert, Vaughan, and Marvell.

ENGL 350B 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 0.5
Shakespeare 1
A study of the plays written before 1599-1600, excluding Julius Caesar.

ENGL 363 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 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.
Enrollment limited to fourth-year students in RPW program, or consent of instructor

ENGL 410A 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 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 430A 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 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 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 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 460A 0.5
British Literature, 1685-1914
A study of works by such writers as Shaw, Conrad, and Yeats.
ENGL 480B 0.5
British Literature, 1914-1945
A study of works by such writers as James Joyce, D.H. Lawrence, and T.S. Eliot.

ENGL 470A 0.5
Contemporary Critical Theory
An examination of recent influential critical theories. Among the schools studied will be feminist criticism, Marxist criticism, psychoanalytic criticism and, especially, deconstruction.

ENGL 495A/B 0.5/0.5
Supervision of Honours Essay
A letter grade for ENGL 485A will be submitted only after the completion of ENGL 495B.

Department of Environment and Resource Studies

Associate Professor, Chairman of the Department
G.B. Priddle, BA, (Western Ontario), MA, PhD (Clark)

Associate Professor, Undergraduate Officer
S.C. Lerner, BA (Ohio State), MA (Columbia)

Professors
M. Chandrashekar, BTech (Indian Institute of Technology, Kanpur), MSc, PhD (Waterloo), Peng
G.R. Francis, BA (Toronto), BA (McGill), MA (British Columbia), PhD (Michigan)
S. Kumar, BSc, MSc (Punjab), MA, PhD (Toronto)

Ph.D. (Columbia)

Associate Professors
D. Estlin, BA, LLB (Alberta)
R. Koith, BBA (Guelph), MA, PhD (Michigan State)

J.B. Robinson, BA (Toronto), MES (York), PhD (Toronto)

Assistant Professors
R.B. Gibson, BA (York), MA, PhD (Toronto)

J.J. Kay, BASc (McGill), MSc, PhD (Waterloo)

M.C. Kesik-Delfgaauw, B.Econ (Amsterdam), MA, PhD (Waterloo)

G.O. Michalenko, BA, PhD (Saskatchewan)
J.E. Robinson, BSc (Waterloo), MES (York), PhD (Michigan)

Faculty Members of Environment and Resource Studies holding cross and/or joint appointments with:

1. Geography, Urban and Regional Planning, and School of Landscape Architecture, University of Guelph

2. Systems Design Engineering

Faculty Members holding cross and/or joint appointments with Environment and Resource Studies from:

3. Environmental Studies

4. Systems Design Engineering

Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

ERS 100 F 2C,1T 0.5
Issue Analysis and Problem Solving for Environmental Studies 1
Designed to complement the introductory overview of ENV S 195 and the introduction to methods and techniques (ERS 150). Selected themes and case examples are analyzed within a framework of concepts and theories from the natural and social sciences. Students undertake practical exercises to develop analytic and problem-solving skills.
Prereq: Honours Environment and Resource Studies students only

ERS 101 W 2C,1T 0.5
Issue Analysis and Problem Solving for Environmental Studies 2
Continuation of ERS 100.
Prereq: Honours Environment and Resource Studies students only

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. Microcomputers will be used for report generation, information organization and basic data analysis.
Prereq: Honours Environment and Resource Studies students only or consent of instructor

ERS 218 F 3C 0.5
Introduction to Canadian Energy Issues
Emphasis on physical concepts, terminology, units, current policy, supply and demand noting technical and economic aspects, and alternative energy strategies.

ERS 220 F 2C,1T 0.5
Introduction to Environmental Economics
Introduction to the history of economic thought and the various schools of economic thought as these relate to environmental cases, issues and analysis.

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: Second year or above

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.

ERS 275A/B/C F,WS 2R 0.5
Special Readings

Background reading and study in consultation with Faculty. Typically utilized when a student must study a topic in connection with other work, but no course offering that topic is available.
Prereq: Consent of Instructor

The letter designation allows this course to be taken more than once for credit

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.
Prereq: Environment and Resource Studies students only
ERS 291 W.S 4S/wkshp 0.5
Seminar-Workshop
Continuation of project begun in ERS 290
Prereq: ERS 290

ERS 295 W 2C,1S 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.
Prereq: Environment and Resource Studies students only or consent of instructor

ERS 305 W 2C,1T 0.5
Ecosystem Perspectives and Analyses
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
Soft Energy Paths in Canada
Analysis and evaluation of energy strategies based on energy conservation and renewable energy systems. Technical, economic, ecological, and social aspects will be examined.
Prereq: ERS 218 or consent of instructor

ERS 320 W 2C,1T 0.5
Environmental Economics
Evaluation of various economic approaches to the environment, introduction to various models used to analyse environmental quality and used in the design of environmental policy and management initiatives.
Prereq: ERS 220 or consent of instructor

ERS 337 F 3C 0.5
Environmental Impact Assessment
Major problems and issues in the management of environmental impacts stemming from development projects. Synthesis of ecological, economic and institutional aspects. Integrating environmental management with social and economic development policies and programs.
Prereq: ERS 241 or consent of instructor

ERS 338 W 3C 0.5
Social 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.
Prereq: ERS 241 or consent of instructor

ERS 350 W 2C 0.5
Community Action on Environmental Problems
The citizen's role in the solution of environmental problems. The work of various community groups is examined and evaluated. Students select topics of particular interest to them for in-depth study.

ERS 360 F 3C 0.5
Man and Nature
An exploration of man's position in nature as viewed in science and arts and in different cultures. Course materials will be drawn from many sources including philosophy, psychology, religions, biology and literature.
Prereq: Third and fourth year students and consent of instructor

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, T.V., 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 375A/B/C F.W.S 2R 0.5
Special Readings or Seminars on Selected Topics
Prereq: Consent of instructor
The letter designation allows this course to be taken more than once for credit

ERS 385 F 3C,1S 0.5
Technology/Lifestyles for a Conservative Society
What is a Conservative Society? What must we do to make our society into a Conservative Society? How do we evaluate the appropriateness of a lifestyle or technology for a Conservative Society? Is a Conservative 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.
Prereq: Second year or above

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: Environment and Resource Studies students only
A letter grade for ERS 390A will be submitted only after the completion of ERS 390B

ERS 390B F,W,S 4S,wkshp 0.5
Seminar-Workshop
Continuation of ERS 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
Continuation of ERS 390B
Prereq: ERS 390B

ERS 396 F 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
ERS 400 F,W 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: Third or fourth year Environment and Resource Studies students only

ERS 418 F 3C 0.5
Energy Research Seminar
Detailed examination of specific energy issues emphasizing research skills and policy context. Students will participate in a research project. General areas of research may include social and political analysis of specific soft energy options, environmental impacts of certain energy technologies.
Prereq: 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 475A/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 man-environment interrelationships. 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: Honours Environment and Resource Studies students only
A letter grade for ERS 490A will be submitted only after the completion of ERS 490B

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: Honours Environment and Resource Studies students only
A letter grade for ERS 491A will be submitted only after completion of ERS 491B

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: Honours Environment and Resource Studies students only
A letter grade for ERS 492A will be submitted only after the completion of ERS 492B

ERS 492B F,W,S 6C 1.5
Senior Honours Assignment
Continuation of ERS 492A.
Prereq: ERS 492A

Courses Offered in India
Courses on the student academic record with the letter I as part of the course number are offered in India.

COURSES NOT OFFERED 1987-88
ERS 351 Organizations and Environmental Management
ERS 450 Environmental Design
ERS 470 Environmental Teaching and Learning

Faculty of 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:

Associate Professor: Associate Dean, Computing and Communications
R.T. Newkirk, BA, MSc, PhD (Western Ontario)

Professor, Director of Teaching Resources and Continuing Education
C.K. Kruppa, BA Honors (Sheffield), PhD (Saskatchewan)

Professors
P.J. Howarth, BA (Cambridge), PhD (Glasgow)
P.H. Nash, BA, MA (California-Los Angeles), Lt. (Grenoble), MCP, MPA, PhD (Harvard), MCIP, AICP

Associate Professor
D. Estrin, BA, LLB (Alberta) (Part-time)

Adjunct Faculty
K. Elliott, Diploma Creative Arts
S. Garrod, BA (McMaster), LLB, MES (York)

Faculty Members of Environmental Studies holding cross and/or joint appointments to:
1Geography
2Psychology, Geography and Planning
3Environment and Resource Studies
4Planning

Faculty Members holding cross and/or joint appointments to Environmental Studies from:

Faculty Members of the Faculty of Environmental Studies holding cross and/or joint appointments to:

1Geography
2Psychology, Geography and Planning
3Environment and Resource Studies
4Planning
Course Descriptions

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.

Prereq: CS 100 or high school computing course or consent of instructor.

Students may receive credit for only one of ENV S 178 and PSYCH 292, STAT 202, 204, 206, 210, 220.

ENV S 195 F 2C 1S 0.5 Introduction to Environmental Studies

Theories, methods and concepts in study of the environment. Emphasis on natural and built environment and relationships between elements of the environment. Environmental planning, management, and design discussed.

ENV S 200 F 2C 1L 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

ENV S 201 F 3C 1S 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 ENV S 402. Topics to be covered include Sources of Law, Nature of Legal Remedies, Common Law, Judicial Review, Administrative Agencies and the law relating to them, Planning Act, Environmental Protection and Assessment Acts, and Federal Fisheries Act.

ENV S 202 W 2C 1L 0.5 Social Science Approaches to Environmental Problems

Research strategies for understanding and addressing environmental problems/opportunity situations based on concepts and methods derived from the social and behavioural sciences. Particular attention is given to determining the appropriate mix of research strategies for a range of situations in terms of data validity and reliability, time and financial constraints, and ethical considerations.

Prereq: Second-year students or consent of instructor.

ENV S 202 F 2C 1L 0.5 Media Tools for Environmental Studies

Introduction 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: ENV S students; others with consent of instructor.

Lab fee of $5 for (optional) use of ES Student Darkroom.

Materials fee of student’s expense.

ENV S 278 F 3C 1L 0.5 Advanced Environmental Research Methods

Advanced methods for developing, evaluating and using evidence in Environmental Studies. Systematic approaches to problems of measurement and problems in time and space. Skill development in applying parametric statistical inference, systems of equations, finite differences, mathematical interpolation and extrapolation with computer aids to analysis.

Prereq: ENV S 178.

Students may receive credit for only one of ENV S 278 and PSYCH 292, STAT 202, 204, 206, 210, 220.

ENV S 310 F 2C 0.5 Behavioural Studies

An examination of the way we perceive our environment—both natural and man-made—and how it influences our attitudes and behaviour. Students will carry out a number of empirical exercises and projects on various aspects of environmental perception and behaviour.

Prereq: Second-, third- or fourth-year students only.

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 and REC 332.

Cross-listed as REC 334.

Students may receive credit for only one of ENV S 334 and REC 334.
Applications of Computer Programming in Environmental Studies

The course will provide an opportunity to apply microcomputers as a tool for the analysis of environmental problems. A top-down, step-wise refinement approach to problem solving through the use of a computer high level programming language (currently Pascal) will be followed. The basis of graphics, data structures and their application to map data sets, algorithms for modelling and the processing of information will also be considered.

Prerequisite: CS 102 and ENV S 178 or consent of instructor.

Students may receive credit for only one of ENV S 378 and PSYCH 292, STAT 202, 204, 205, 210, 220.

Environmental Studies Workshop

An interdisciplinary workshop focusing upon environmental issues in a project or research format.

Prerequisite: Third and fourth year students in Environmental Studies, enrolment is by research team only with representatives from at least three units of the faculty (max. 7 people) and subject to selection of an advisor and a satisfactory project or research proposal.

ENV S 320 Z 1.5

Waterloo in Australia, Victoria

Description in Environmental Studies program section (page 106).

ENV S 333 Z 2.5

Waterloo in Australia, Victoria

As 320 Z.

ENV S 340 S 0.5

Waterloo in Australia, Victoria

As 326 Z.

ENV S 395 Z 2.5

Waterloo in Australia, Victoria

Description in Environmental Studies program section (page 106).

ENV S 396 Z 2.5

Waterloo in Australia, Victoria

As 396 Z.

ENV S 397 Z 2.5

Waterloo in Australia, Victoria

As 397 Z.

ENV S 401 F 0.5

Environmental Law

Detailed consideration of recent developments in Canadian environmental and resources regulatory regimes combined with guidance on presentation of expert evidence to courts and tribunals.

Prerequisite: ENV S 201

ENV S 402 W 3C, 1.5

Planning Law

An analysis of the legal basis for planning in Ontario and the practice of planning law as it affects planners, municipalities, local councils, property owners and residents. The roles of planning board, municipal councils, the Ontario Municipal Board, the Ministry of Housing, provincial Cabinet and the Niagara Escarpment Commission in the planning process will be discussed.

Prerequisite: ENV S 201

ENV S 411 F 3S, 0.5

Alternative Future Environments 1

Analysis of "ideal" environments of the past, including "utopian" communities. Scrutiny of current "concepts" of future environments, including distillation of works of Bell, Clarke, Commoner, de Chardin, de Jouvenel, Dror, Duxius, Ehrlich, Forrester, Fuller, Kahn, Mead, Meadows, Mchale, Michael, Polak, Thackray, Thompson, Toynbee and Ward.

Prerequisite: third- or fourth-year standing or consent of instructor.

ENV S 417 F 3S, 0.5

Land Use History and Landscape Change 1

Literature, theory and method relating to man's effects on landscapes and ecosystems. A human ecological approach. Case studies and field work.

Prerequisite: Consent of instructor.

Lab fee of $20

ENV S 433 W 3C, 2ST 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 publics and indigenous people in the design and management of natural areas will be studied.

Prerequisites: REC/ENV S 334, Cross-listed as REC 433

Students may receive credit for only one of ENV S 433 and REC 433.

ENV S 434 W 3C, 0.5

Advanced Park Planning and Management

A study of policies, procedures, and practices relative to the management of natural resources. Emphasis is placed on an ecological systems approach to management as it relates to parks at all levels of government.

Prerequisites: REC/ENV S 334, Cross-listed as REC 434

Students may receive credit for only one of ENV S 434 and REC 434.

1 Classical Studies

2 Religious Studies

R refers to faculty member at Renison College.

COURSES NOT OFFERED 1987-88

ENV S 111 Introduction to the Study of the Future

ENV S 203 Media Tools for Environmental Studies, Advanced Level

ENV S 378 Applications of Computer Programming in Environmental Studies

ENV S 412 Alternative Future Environments 2

ENV S 418 Land Use History and Landscape Change 2

ENV S 444 Land Evaluation and Resources Management

ENV S 500 Professional Development in Environmental Management

Department of Fine Arts

Associate Professor, Chairman

A. Roberts, BA (Guelph), MA (Claremont)

Undergraduate Officer

To be announced

Professors

V. Burnett, BS (Columbia), MA (California)

P. Forsyth, 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, BA, MA, PhD (Iowa), R.

A. Green, BFA (Art Institute of Chicago)

D. I. MacKay, BFA (Mt. Allison), MFA (Cornell)

J. Uhde, MA (Purdue University, Bmo), PhD (Waterloo)

Assistant Professors

J. Feught, BFA (Calgary), MVA (Alberta)

E. Kliman, MA, PhD (Toronto)

Adjunct Faculty

P. Swann, BA, MA (Oxford), DLitt (Brock), DLitt (Queen's)

Faculty Members holding cross appointments to Fine Arts from:

1 Classical Studies

2 Religious Studies

R refers to faculty member at Renison College.
Course Descriptions

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 F 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 F 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 F 3C 0.5
Art of the 18th Century in Europe
A study of painting, sculpture, graphic arts and architecture in 18th century Europe.

FINE 218 W 3C 0.5
Western Religious Art
An introductory survey of the visual art and architecture of Judaism and Christianity in the common era. The development and subsequent changes in style in places of worship and ceremonial objects and ornaments, and the changing forms of religious expression through visual art will be studied.

FINE 310 W 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 316 F 3C 0.5
Canadian Native Art
The arts and crafts of Canadian Indian and Inuit (Eskimo) peoples are examined with slide lectures, films, and student presentations.

FINE 318 W 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.

FINE 319 W 3C 0.5
Contemporary Art
A seminar exploring the contemporary avant garde art movements through critical analysis, historical correlation, discussions with artists and trips to Toronto and New York. Topics covered will include environmental sculpture, conceptual trends, earth works, performance, technology, postal art, and the business aspects of art.

FINE 319A F 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 F 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-Modern Abstraction and Field Painting, and Kinetic and Light Sculpture.

FINE 330 W 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 R 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 R 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 R 0.5
Senior Seminar 1
Admission by consent of instructor.

FINE 473 W R 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.

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 W S, std, R 0.5  
Senior Honours Presentation 2  
Course description on last page of Studio Offerings.

FINE 491A W S, std, R 0.5  
Senior General Seminar 2  
Course description on last page of Studio Offerings.

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FILM STUDIES OFFERINGS

FINE 250 F 3L, 2D 0.5  
History of Film 1 (1895-1940)  
General 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.  
Film fee.

FINE 251 W D, M, C 0.5  
History of Film 2 - Sound Film  
A continuation of FINE 250. The expression of film history into the sound era (since 1929) including the most recent period. Regular film screenings.  
Prereq: A film course or consent of instructor  
Film fee.

FINE 252 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 R S 266  
Film fee: $5.00

FINE 253 W 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 R S 267  
Film fee: $5.00

FINE 255R 2C, 1D 0.5  
Film as Social Criticism  
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.  
Film fee: $5.00

FINE 256W W 0.5  
Canadian Film  
A study of Canadian film, from 1895 to the present, based on the screening and analysis of selected films.  
This is a WLU course for Film Studies Majors/Minors only.

FINE 259W W 0.5  
German Film  
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, Schönördorff and others.  
This is a WLU course for Film Studies Majors/Minors only.

FINE 270W F 0.5  
The Film as a Modern Medium  
A study of the technical problems of filmmaking, leading to the writing, production and editing of a silent film.  
This is a WLU course for Film Studies Majors/Minors only.

FINE 271W W 0.5  
Sound and Colour in Film  
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.  
Prereq: FINE 270W, any other film course or consent of instructor.  
This is a WLU course for Film Studies Majors/Minors only.

FINE 350 F D, C 0.5  
French Film After 1945  
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 "Academic tradition" of the 40's and 50's, and the rebellious nouvelle vague of the 60's. (Bresson, Carné, Ophüls, Renoir, Chabrol, Godard, Malraux, Truffaut, Resnais, and others.) Regular film screenings.  
Prereq: A Film course or consent of instructor  
Film fee.

FINE 351 W D, C 0.5  
East European Film After 1945  
A study of the development of motion picture art in Eastern Europe after World War II. Selected works of major directors of Czechoslovakia, Hungary, Poland, the USSR and Yugoslavia will be discussed, as well as characteristic features of East European cinema as a whole (Chytilova, Forman, Janczo, Makavejev, Tarkovski, Wajda, and others). Regular film screenings.  
Prereq: A Film course or consent of instructor  
Film fee.

FINE 352 F 2L, 2D 0.5  
The Cinema of Science Fiction  
A chronological survey of one of the richest and 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, Lucas, Marker, Siegel, Tarkovski, Truffaut and other directors). Regular film screenings.  
Prereq: FINE 250/251 or consent of instructor  
Film fee.

FINE 353 W 2L, 2D 0.5  
Contemporary Italian Film  
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, Rossellini, Visconti and others. Regular film screenings.  
Prereq: FINE 250/251 or consent of instructor  
Film fee.

FINE 355R/357R 0.5 0.5  
Special Topic in Film  
Special topics will be announced from year to year.
Course Descriptions

FINE 359 F,W 3C 0.5
Film and Literature in German
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.
Prereq: Open to all students above first year
Cross-listed as GER 300
Taught in English

FINE 360 F D,C 0.5
Film Theory I
Motion pictures as an art form. Discussion of the visual language and the principal structural elements of film work. Relationship between film, television and other arts. Regular film screenings.
Prereq: A film course or consent of instructor
Film fee

FINE 361 W D,C 0.5
Film Theory II
Prereq: A film course or consent of instructor
Film fee

FINE 3802 and 3812
Film Studies Seminar
These two courses will offer an introduction to key aspects of motion picture and TV production, film preservation and restoration with visits to studios, film archives, film museums. Screening of selected quality films will be complemented by discussions focussing on material which is unavailable in Canada, with special attention paid to Third World production. Direct contact and interaction between course participants and scholars/students in France is expected.
(Three weeks Paris.)

FINE 390 F R 0.5
Selected Subjects in Fine Arts
Research and reading courses under the direction of individual instructors.
Prereq: FINE 120 or 221 or consent of instructor
Lab fee

FINE 391 W R 0.5
Selected Subjects in Fine Arts
Research and reading courses under the direction of individual instructors.
Prereq: FINE 120 or 221 or consent of instructor
Lab fee

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 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.

STUDIO OFFERINGS

FINE 120 F 8L 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.
Lab fee.

FINE 121 W 9L 0.5
Fundamentals of Visual Art 2
A continuation of FINE 120 with emphasis on colour.
Prereq: FINE 120
Lab fee.

FINE 220 F 12L 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
Lab fee.

FINE 220A F 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
Lab fee

FINE 221 W 12L 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
Lab fee.

FINE 222 F 12L 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 an expressive medium enhanced by surface treatment.
Prereq: FINE 120/121
Lab fee.

FINE 223 W 12L 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 222
Lab fee.

FINE 223A W 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 9L 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
Lab fee.

FINE 225 W S 9L 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
Lab fee.

FINE 226 Printmaking
Introduction to materials and methods of printmaking. Current offerings are given below.


FINE 226A F 12L 0.5
Printmaking (Intaglio)
An introduction to basic intaglio techniques including etching and engraving through workshops and class demonstrations.
Prereq: FINE 120/121 or consent of instructor
Lab fee

FINE 226B F 12L 0.5
Printmaking (Relief)
An introduction to relief printing including collograph, wood block, lino cut and type using press and non-press materials to make print images in a series of workshops and demonstrations.
Prereq: FINE 226A or permission of instructor
Lab fee

FINE 226C F 12L 0.5
Printmaking (Screen)
An introduction to screen printing, with emphasis on exploration of ink properties and stencil techniques.
Prereq: FINE 120/121 or consent of instructor
Lab Fee.

FINE 227 F 5L 0.5
Scientific Drawing
Through studio experiences, students will learn techniques for making accurate scale drawings of biological subjects in line and value, using various media. Methods of preparing drawings for reproduction will be included.

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 W 12L 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 in both 2 and 3 dimensional expressive forms. Traditional textile materials and methods will be applied to the creation of contemporary expressive and autonomous forms. Students will supply their own materials.

FINE 228C W 3std 0.5
Images and Effigies
A study of contemporary and historical images and effigies in art, ritual, and popular culture, and a series of studio projects in which three-dimensional images are constructed.

FINE 229D F 3std 0.5
Applied Graphics
A studio course using applied graphics techniques, including illustration, typographic composition, and perspective drawing. Methods of preparing work for reproduction will also be explored.

FINE 228E W 9L 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 student’s expense.
Prereq: FINE 120/121

FINE 228F F 8L 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.

FINE 228H F 8L 0.5
Electronic Imaging 1
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
Lab fee

FINE 320 F 12L 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
Lab fee.

FINE 321 W 12L 0.5
Advanced Painting
A continuation of Fine arts 320 with a further emphasis on independent problems.
Prereq: FINE 320 or consent of instructor
Lab fee.

FINE 322 F 12L 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
Lab fee.

FINE 323 W 12L 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 W 5 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 9L 0.5
Advanced Drawing
A course in which drawing is investigated as a means of expression and communication. The human figure, objects, and the landscape will be studied as sources of artistic imagery. The student will be encouraged to experiment with imagery, to develop personal vision, and to devise individual formal means of expression.
Prereq: FINE 224 or consent of instructor
Lab fee.

FINE 325 W 9L 0.5
Advanced Drawing 2
Continuation of FINE 324

FINE 326A W 6L 0.5
Advanced Printmaking (Lithography)
An introduction to plate lithography with the emphasis on printmaking as a vehicle for serious creative expression. Integration with other forms of printmaking can be explored by senior printmakers.
Admission by permission of instructor.
Lab fee.

FINE 326A W 8L 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 328G W 9L 0.5
**Advanced Applied Graphics**
A continuation of FINE 228D, a critical exploration of commercial illustration, type and symbol of design, multi-colour print reproduction and various other advanced graphics techniques.
Prereq: FINE 228D

FINE 328H W 8L 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 colour photographs to document their work. Intended for Fine Arts majors.
Supplies at student’s expense.
Prereq: FINE 228H or consent Lab fee

FINE 329 F 3std.C 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 382 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 420 W 9L 0.5
**Senior Graphics Techniques 1**
Admission by consent of instructor.

FINE 472 F R 0.5
**Senior Seminar 1**
Admission by consent of instructor.

FINE 473 W R. 0.5
**Senior Seminar 2**
Admission by consent of instructor.

FINE 490 C.G 15L 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 endeavour 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.
Required of all students in Honours Fine Arts.
Admission by permission only.

FINE 491 W 15L 0.5
**Senior Honours Presentation 2**
A continuation of FINE 490.
Admission by permission only.

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**Course Descriptions**

**Department of French**

Associate Professor and Chairman of the Department
W.D. Wilson, MA, PhD (Trinity College, Dublin)

Associate Professor and Graduate Officer
P.G. Socken, BA (Toronto), MA (Iowa), PhD (Toronto)

Associate Professor and Undergraduate Officer
H.S. Fournier, BA (Toronto), MA, PhD (Western Ontario)

Professors
A. Ages, BA (Carleton), MA, PhD (Ohio State)

Associate Professors
P.H. Dube, BA, MA (Toronto), PhD (Ohio State)
J.R. Dugan, BA, MA (Toronto), PhD (Yale)
D.W. Russell, BA, MA, PhD (Toronto)

Assistant Professors
C.A. Abbott, BA, MA, PhD (Ohio State); R.J. Fournier, MA, PhD (Western Ontario)
G. Losier, BA, MA (Ottawa), PhD (Paris)

Lecturers
A. Brunelle, BA, MA (Montreal)
N. Rolland, Baccalauréat éts Arts, Licence éts Lettres (Laval), MA (Toronto)

Language Instructors
P. Apelvich, BA, MA (Waterloo)
C. Black, MA (Waterloo), Licence éts lettres (Grenoble)
J. Forster, BA (Queen’s)
H. McLenaghan, Licence en Phil. Rom. (Brussels), MA (Waterloo), PhD (Western Ontario)
T. Sabary, Licence éts lettres (Toulouse)
J refers to faculty members at St. Jerome’s College

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**FIRST-YEAR 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 Year Two (Ontario Grade 10) should enrol in French 151. Those with secondary school Year Three (Ontario Grade 11) should enrol in French 152.

3. Students with secondary school Year Four French (Ontario Grade 12) or equivalent should enrol in French 153.

4. Students with Grade 13 secondary school French should enrol in French 192A/B and/or French 195/196.

5. Students may enrol only in courses for which they have secondary school antirequisites with the written permission of the Department of French.

6. All students intending to register in any University of Waterloo French language course at the 100 level (FR 151, 152, 155, 192A, 192B) who have secondary school Year Five (Ontario Grade 13) French or equivalent must take the French Language Placement Test to be held on Thursday, September 10, 1987 at 11:30 a.m. to 1:30 p.m. in Arts Lecture Hall 116.

7. Students should consult the Departmental brochure “French at Waterloo” for further details, and for any changes in offerings after the Calendar goes to press.

8. Linguistics, Language, Civilization, and Literature courses are listed separately below.
Basic French
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.
Prereq: Secondary School Year Three French (Ontario Grade 11) or equivalent.
Also offered at St. Jerome's College
FR 155  F,W,S  4C,1L  0.5
Intensive Review of French
A one-term intensive review of French grammar and vocabulary. Involves reading, writing and speaking French.
Prereq: FR 152 or Secondary School Year Four French (Ontario Grade 12)
Also offered at St. Jerome's College
FR 198  F  3C  0.5
Reading French
A course for graduate students with no knowledge of French who wish rapidly to develop an adequate reading knowledge of French. Not open to undergraduate or post-degree students except with the written consent of the Department of French.
This course may be taken on a CR/FAIL basis only. There is no grade assigned.
Note to Graduate Students: The Department of French provides a written French Reading Proficiency Test for graduate students wishing to prove an already acquired reading knowledge of French. Students who do not yet have this knowledge should enroll in FR 198/199. Successful completion of HH 198/199 satisfies the requirement for a reading knowledge of French in some disciplines.
Graduate students should consult their home departments on this matter.
FR 199  W  3C  0.5
Reading French
A continuation and completion of the work begun in FR 198.
Prereq: FR 196 or consent of the Department. Not open to undergraduate or post-degree students except with the written consent of the Department of French.
This course may be taken on a CR/FAIL basis only. There is no grade assigned.
FR 207  3C,1L  0.5
Spoken French
Advanced level for continued intensive oral and aural training in the classroom. Particular emphasis on comprehension and conversation, with the class divided into small groups for practice in speaking.
Prereq: FR 192, 195/196, 206, 251 or consent of Department
Maximum enrolment of 15 in each section.
FR 208  3C,1L  0.5
Spoken French
Continuation and completion of work begun in FR 207.
Prereq: FR 207 or consent of Department
Maximum enrolment of 15 in each section.
FR 290D  3C  0.5
Spoken French Through Drama
A special section of FR 208 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 207 or consent of Department
Maximum enrolment of 15
FR 210  2C  0.5
Report Writing in French
This course is designed to give students practical work in the research, the organization and the writing of a variety of reports in the French language.
Prereq: FR 192, 195/196 or consent of Department
May only be used for elective credit by French Major or Honours students.
FR 251  3C,1T  0.5
French Language
Continued training in spoken and written French, with emphasis on more difficult problems of the language. Taught in French.
Prereq: FR 192, 195/196 or consent of Department
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 192, 195/196 or consent of Department

FR 293 3C 0.5
**French for Bilingual Students II**
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 Department

FR 301 2C2T 0.5
**French Language**
This course includes a review of advanced grammar. It aims to develop writing skills through compositions, and to provide practice in advanced oral skills with work in small groups. Taught in French.
Prereq: FR 205, 252, or consent of Department

FR 302 2C2T 0.5
**French Language**
This course concentrates on the development of writing skills through a study of the practical stylistics of French, and provides practice in advanced oral skills, with work in small groups. Taught in French.
Prereq: FR 251 and 207 or 253 or consent of Department

FR 401 0.5
**Advanced Language Study**
A course in advanced translation, dealing with both the theories of translation and their implementation. Special attention will be paid to metalinguistic problems which affect style and meaning.
Prereq: FR 301, 302, or consent of the Department

FR 420 0.5
**Advanced Language Study**
A continuation of the work done in FR 401. Special attention will be given to the practice of translation.
Prereq: FR 401 or consent of the Department

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**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 293 3C 1L 0.5**
**Introduction to the Phonetics of French**
This course introduces the student on a practical level to the phonetic system of contemporary French, and on a theoretical level to a phonological description of that system. Taught in French.
Prereq: FR 192 or consent of Department

**FR 303 3C 1L 0.5**
**Introduction to Linguistics**
This course will introduce students to a basic theoretical reflection on language. Various important schools of modern linguistic thought ranging from Saussure to Chomsky will be discussed. Taught in French.
Prereq: FR 250, 252, or consent of Department

**FR 403 0.5**
**Topic in Linguistics**
An area in Linguistics of particular interest to the instructor and the students will be chosen. Taught in French.
Prereq: FR 250, 252 or consent of Department

**FR 405 3C 0.5**
**Medieval French Language**
Introduction to the early development of French.

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**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 representative literary texts as well as such genres as film and the popular press.
Prereq: FR 192 or consent of Department
Offered at St. Jerome's College

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**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 273 3C 0.5**
**Aspects of Quebec**
A presentation of traditional and contemporary Quebec in the fields of the Arts, literature, music, politics and society. Taught in French.
Prereq: FR 192, 196 or consent of Department

**FR 291 3C 0.5**
**French Civilization 1**
This course traces the cultural development of France from its origin to the beginning of the Napoleonic Empire. 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 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 393A/B 0.5/0.5**
**French Civilization, 1884-1914**
Offered in the Nantes Program.

**FR 395A/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.

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FR 196 3C 0.5
French Literature 2
For students with Ontario Grade 13 French. A study of various critical approaches and their application to French literature, with emphasis on the literature of France. A continuation of FR 195. Taught in French.
Prereq: Grade 13 French or equivalent, FR 152, 155 or consent of Department
FR 231 3C 0.5
Survey of Seventeenth Century French Literature
This course will trace the development of French literature from 1600-1700. Taught in French.
Prereq: FR 192, 196 or consent of Department

Offered at St. Jerome's College

FR 232 3C 0.5
Topics and Problems in Seventeenth Century French Literature
A more detailed study of writers/works of the classical period. Taught in French.
Prereq: FR 192, 196 or consent of 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 192, 196 or consent of Department

FR 264 3C 0.5
Twentieth-Century French Theatre
The study of a representative number of authors and texts from Claudel to Ionesco. Taught in French.
Prereq: FR 192, 196 or consent of 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 192, 196 or consent of Department

FR 342 3C 0.5
Eighteenth Century French Literature
This course will trace the development of French literature from 1700-1800. Taught in French.
Prereq: FR 192, 196 or consent of Department

FR 343 3C 0.5
Topics and Problems in Eighteenth Century French Literature
A more detailed study of one or more aspects of the Enlightenment. Taught in French.
Prereq: FR 192, 196 or consent of 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 192, 196 or consent of Department
Not open to students who have taken FR 254.
FR 363 3C 0.5
Twentieth Century French Literature
This course will trace the development of French literature from 1900 to the present with emphasis on the Novel. Taught in French.
Prereq: FR 192, 196 or consent of Department

FR 371 3C 0.5
French-Canadian Poetry
A study of its evolution from Octave Crémazie to Anne Hébert. Taught in French.
Prereq: FR 192, 196 or consent of Department

FR 372 3C 0.5
Contemporary Quebec Theatre
A study of contemporary Quebec theatre, from Gratien Gélinas to Michel Tremblay. Taught in French.

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.

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 192, 196 or consent of Department

Offered at St. Jerome's College

FR 421 3C 0.5
French Prose of the Renaissance
Readings in sixteenth century literature; Rabelais, Montaigne, etc. Taught in French.
FR 422 3C 0.5
French Poetry of the Renaissance
Readings in sixteenth century poetry: Marot, the Pléiade, the baroque poets, etc. Taught in French.
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 192, 196 or consent of Department

FR 482 3C 0.5
Study of Individual Authors
Each year a different author is the subject of specialized study to permit an in depth exploration of his/her literary qualities. Taught in French.
Prereq: FR 192, 196 or consent of Department

FR 490-498 0.5
Senior Tutorials
A small group of students follows a course of study under the supervision of a faculty member. For details, inquire of the Department.
**General Engineering**

**Assistant Professor**
D.A. Fraser, BASc, MASC, B.Ed (Toronto); PhD (Waterloo)

**Lecturers/Demonstrators**
S.H. Birkett, BASc (London)
J. Lowe, BSc (Carleton), Recipient of the Distinguished Teacher Award
K. Riepert, BASc (Waterloo)

**Course Descriptions**

**GEN E 010 F, W 1S 0.0**

**Co-ordination Orientation**
Given by the Department of Co-ordination for students in Year One Engineering. Its purpose is to introduce students to the various features of the co-operative program and engineering as a profession.

**GEN E 062 F 3C 0.5**

**Introduction to Human Communications Systems**
The processes involved in man-man, man-machine and mass communications will be discussed. Models of communication systems. The contributions and points of view of the various disciplines which make up the spectrum of communication studies today.

*Not open to Year One students.*

**GEN E 115 F 2C, 4L 0.75**

**Engineering Concepts**
An introduction to some of the basic methods and principles used by engineers including fundamentals of graphics, projections, spatial co-ordinate plotting, free-hand sketching, vector graphics.

**GEN E 121 W, S 3C, 21 0.5**

**Digital Computation**
Introduction to electronic digital computers, hardware and software organization; basic features of FORTRAN and/or PASCAL, examples of efficient numerical algorithms for basic scientific computations.

**GEN E 123 W, S 3C, 17, 3L (4 times/term) 0.5**

**Electrical Engineering**
Introduction to electric charge and fields; ac circuit analysis; Kirchhoff's circuit laws; 2 ports and op-amps; capacitance, inductance and impedance; magnetic force and induced voltage. Semiconductors. Instrumentation.

*For Year One Mechanical Engineering students.*

**GEN E 124 W, S 3C, 17, 3L (4 times/term) 0.5**

**Electrical Engineering**
Introduction to electric charge and fields; ac circuit analysis; Kirchhoff's circuit laws; 2 ports and op-amps; capacitance, inductance and impedance; magnetic force and induced voltage. Semiconductors. Instrumentation.

**GEN E 301 W, S 4D 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 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 Chairman of the Department in which the student is registered.*

**GEN E 302 F, W 4D 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 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 Chairman of the Department in which the student is registered.*

**GEN E 351 F, W 2C, 2S**

**Information Technology and Society**
The social and technological concepts of an information society. Overview of information technology; current states and future directions in computers and communications. Study of an information system, its promises and problems including privacy, security, user acceptability, retaining, control, etc. Impact of information technology on the quality of life; employment, freedom of information, leisure, creativity, etc. One application area will be selected for study each term from Computer-Aided Learning, Office Automation, Computer-Aided Design and Manufacturing, Telecomputing, etc.

*Prereq: Open to third- or fourth-year students in any faculty with at least one university-level computing course, or consent of the instructor.*

**GEN E 362 W 2C 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).*

**GEN E 401 F, S 4D 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 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 Chairman of the Department in which the student is registered.*

**GEN E 402 W 4D 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 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 Chairman of the Department in which the student is registered.*

**GEN E 411 F, S 3C 0.5**

**Engineering Law**

*Restricted to fourth-year Chemical, Computer/Electrical and Systems Design Engineering Students.*
Department of Geography

Professor, Chairman of the Department
W.B. Mitchell, BA, MA (British Columbia), PhD (Liverpool)

Professor, Dean of the Faculty of Environmental Studies
J.H. Bate, BA, MA (British Columbia), PhD (London)

Professor, Associate Dean, Undergraduate Studies and Educational Liaison
G.R. McBoyle, BSc, PhD (Aberdeen)

Professor, Associate Chairman, (Graduate Studies)
G. Wall, BA (Leeds), MA (Toronto), PhD (Hull)

Professor, Associate Chairman, (Undergraduate Studies)
L.H. Russwurm, BA, MA (Western Ontario), PhD (Illinois)

Professor, Advisor on Interdisciplinary Programs to the Vice-President, Academic
J.S. Gardner, BSc (Alberta), MSc, PhD (McGill), Recipient of the Distinguished Teacher Award

Professors
C.R. Bryant, BA, PhD (London)
A. Diom, BA (Wayne State), MA, PhD (Michigan)
D.K. Erb, BSc (Western Ontario), MA (Toronto), PhD (McGill)
L.T. Guelke, BSc (Cape Town), MA (York), PhD (Toronto)
P.J. Howarth, BA (Cambridge), PhD (Glasgow)
R.M. Irving, BA, MA (Toronto), PhD (Minnesota)
C.K. Knapper, BA Hons (Sheffield), PhD (Saskatchewan)
R.R. Krueger, BA, MA (Western Ontario), PhD (Indiana), Recipient of the Distinguished Teacher Award
A.G. McLellan, BSc, PhD (Glasgow)
G.G. Mulamoottil, BSc (Mysore), MSc (Bombay), PhD (Delhi)
P.H. Nash, BA, MA (UCLA), CE (Grenoble), MCP, MPA, PhD (Harvard), MCIP, AICP
J.G. Nelson, BA (McMaster), MA (Colorado), PhD (Johns Hopkins)
R. Preston, BA (Central Washington), MA (Washington), PhD (Clark)
D.F. Walker, BSc (London), MA, PhD (Toronto)

Associate Professors
R.A. Bullock, BA, MA (Belfast), PhD (London)
T.E. Duning, BA (York), MA (Western Ontario), PhD (Toronto)
B. Hyma, BSc, MSc (Madras), MA (Sheffield), PhD (Pittsburgh)
A.B. Kesik, MA, PhD (UMCS-Lublin, Poland)
E.F. LeDrew, BA (Toronto), MA, PhD (Colorado)
G.B. Priddle, BA (Western Ontario), MA, PhD (Clark)
J.B. Robinson, BA (Toronto), MES (York), PhD (Toronto)
S.L. Smith, BA (Wright State), MA (Ohio State), PhD (Texas A&M)

Assistant Professors
D. Dudycha, BA (Waterloo Lutheran), MA (Waterloo), PhD (London School of Economics)
C. DuFournaud, BA (Sir George Williams), MA (Laval), PhD (Toronto)
E.R. Officer, BA (British Columbia) MA (Wisconsin)

Adjunct Faculty
R. Bell, BA, MA (McMaster)
G. Brannon, CC
D.I. McKenzie, BES, MA (Waterloo)
S. Pala, BSc (Ankara), PhD (Freiburg)
M.E. Sanderson, BA (Toronto), MA (Minnesota), PhD (Michigan)

Course Members of Geography holding cross and/or joint appointments to:
1Planning
2History
3Recreation and Leisure Studies
4Economics
5Recreation and Leisure Studies
6Environment and Resource Studies
7Planning
8Environmental Studies

Course Descriptions

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 man's cultural environment. Directed towards man-land and location analysis themes.
GEOG 102 F,W,S 2C,2L 0.5
Introduction to Physical Geography
Emphasis on the natural environment as an integrated system. Selected aspects of weather-climate, water, soils, biota, landforms along with flows of energy, water and matter and their effects on the subsystems of the natural environment.

GEOG 125 F 3C 0.5
Introduction to the Third World
A study of the Third World. Topics include: population issues, planning and practices; education and health in the social development process; urbanization and industrialization; planning for rural and urban development in Asia, Africa and Latin America.

GEOG 127 W 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 180 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.

Lab fee $15-$25.

GEOG 201 W,S 3C 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.

Prereq: GEOG 102

GEOG 202 W, S 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 analyse the location structure of primary, secondary and tertiary activities.

Prereq: A first-year human geography course or equivalent

GEOG 203 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, Alpine and Mediterranean World, Greece, Hungary, Switzerland.

Prereq: A first-year human geography course.

GEOG 204 W 3C 0.5
Soviet Union
Introduction to the geography of the Soviet Union, with a focus on selected problems in urbanization, industrialization, resource use and regional economic development in a planned economy.

GEOG 205 F 2C,2L 0.5
Africa
The geography of modern Africa south of the Sahara in the context of changing attitudes to the continent on the part of the "developed" countries. Attention will focus on problems of the physical, social and economic environments.

GEOG 208 W 2C,2L 0.5
Applied Climatology
World climate and weather patterns and their impact on man. Topics include atmospheric circulation, climate classifications, air pollution, urban climate, climate change and weather modification.

Prereq: GEOG 102

GEOG 220A 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, resource use, population pressure, urban and rural land use, and human impact on the earth.

GEOG 220B W 2C,2L 0.5
The World Region and World Issues
Significance of Regional Geography and analysis of regions of the world, such as Canada, Japan and Switzerland and how they are integrated into The World Region. Issues such as Underdevelopment, Energy, Trade, Tourism, Banking and Environmental Degradation are discussed within the matrix of The World Region.

GEOG 221 W 3C 0.5
The United States
Focuses on population shifts, urban developments, and regional economic development in the context of the nation and selected regions.

GEOG 225R W 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.

Prereq: Any Faculty of Environmental Studies course.

GEOG 230 W 3C 0.5
Cultural Geography
The Geography of culture and the role of cultural factors in environmental relationships.

Prereq: GEOG 101

GEOG 232 F 3C 0.5
Geography of Population

GEOG 251 W 3C 0.5
Cities in Canada
An introduction to some basic concepts in urban studies emphasizing a systematic approach to processes and problems of urban development in Canada.

Field trip fee $5-$10.

GEOG 275 F,W, 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.

GEOG 300 F,S 0.5
Geomorphology and the Southern Ontario Environment
Field work and field trips in exploring the evolution of S. Ontario landforms. The identification of landforms, landform assemblages and their relationships. The meaning and utility of this information in terms of the contemporary and future environment will be stressed.

Prereq: Third and fourth year students only with GEOG 201 or consent of instructor

Lab fee $10-$15.
Course Descriptions
Geography

GEOG 304 F,S 4 credits 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; nonsurvey data collection techniques; practical applications.
Prereq: Second or third-year students with ENV S 278 or consent of instructor
Cross-listed as PLAN 307
Students may receive credit for only one of GEOG 307 and PLAN 307.

GEOG 309 F 2C,1D 0.5
Physical Climatology
Principles of physical climatology with emphasis on climate regions of Canada. Topics include radiation and energy balances, general circulation patterns, synoptic development, climatic variability and microclimatology.
Prereq: GEOG 102

GEOG 311 W 3C 0.5
Regional Industrial Development
Manufacturing in the context of economic development at regional and urban scales. Focus on empirical studies and related planning issues in Canada and the United Kingdom.
Prereq: GEOG 202 or consent of instructor

GEOG 315 W 3C 0.5
Agricultural Geography
The geographical dimensions of agricultural systems. Diffusion of innovations, regional evolution of agricultural structure and vertical integration. Comparative study of programs of government intervention in agriculture in Canada and Europe. Some field trips.
Prereq: GEOG 202 or consent of instructor

GEOG 317 W 3C 0.5
Nonparametric Statistics
The theory and application of nonparametric statistics, with particular emphasis upon social science problems.
Prereq: ENV S 278 or consent of instructor
Cross-listed as PLAN 317
Students may receive credit for only one of GEOG 317 and PLAN 317

GEOG 318 S 3C 0.5
Special Analysis
Advanced quantitative analysis and sampling in a spatial context. A selection of techniques from gravity models, linear programming, nearest neighbour analysis, Markov chain analysis, graph theory, simulations and trend surface analysis.
Prereq: ENV S 278 or consent of instructor
Cross-listed as PLAN 318
Students may receive credit for only one of GEOG 318 and PLAN 318

GEOG 319 F 2C,1L 0.5
Economic and Social Techniques for Regional Planning
Critical appraisal of a selection of descriptive and evaluative regional analysis techniques. Economic considerations of regional development. Reliability and applicability of data; input-output analysis; cost-benefit analysis; planning, programming and budgeting systems; and social area analysis.
Prereq: ECON 101, 102 or consent of instructor
Cross-listed as PLAN 319
Students may receive credit for only one of GEOG 319 and PLAN 319

GEOG 320 W 3C 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 321 W 3C 0.5
Comparative Regional Problems
A geographical analysis of selected regions and current problems. The theme chosen in any given year will vary.

GEOG 325 R W 3C 0.5
Special Topics in Development of the Third World
Focuses on geographic perspectives on social planning and participatory approaches to regional/community development using case studies (seminar method). Oriented to providing useful background for students interested in overseas volunteer work programs.
Prereq: First- or second-year courses related to Third World studies or consent of instructor

GEOG 341 F 2C,1S 0.5
Historical Geography of Canada 1
The changing geographies of settlement and resource use from the Discoveries to the early nineteenth century.
Prereq: A second-year human geography course or consent of instructor

GEOG 342 W 2C,1S 0.5
Historical Geography of Canada 2
The changing geographies of settlement and resource use in the nineteenth and early twentieth centuries.
Prereq: A second-year human geography course or consent of instructor

GEOG 345 F 3C 0.5
Political Geography
A study of differences from place to place in political phenomena. Subjects covered include the interrelationships of states and nations, centrifugal and centripetal "forces" within states, electoral geography, boundary and frontier problems, the location of capital cities, internal organization of states, external relations, and geopolitics.
Prereq: A second-year human geography course or consent of instructor

GEOG 349 W 3C 0.5
The City as a System
Theories, models, and research procedures in the study of internal 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 202 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 202 or GEOG 251 or consent of instructor

GEOG 352 F 3C 0.5
The Rural-Urban Fringe
Comparative study of the natural, economic and cultural environments of the rural-urban fringe in the Western World. Emphasis on the interrelationships between the resource base and urban demands on it.
Prereq: GEOG 202 or consent of instructor

GEOG 353 W 3C 0.5
Marketing Geography
Emphasized are consumer behaviour, firm organization and behaviour, and modelling and analysis of commercial location patterns at both inter- and intra-urban scales.
Prereq: ENV S 278 and a third-year urban or quantitative geography course or consent of instructor
GEOG 356 W 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.
Pre: ENV S 1/8 or consent of instructor
Field Trip fee $10-$15

GEOG 357 F,W 3C 0.5

Conservation and Resource Management
History of the conservation movement; ecological principles of conservation and resource management. Analysis, use and planning of recreational resources. Section one of this course uses a self-directed learning approach.
Pre: ENV S 200
Cross-listed as PLAN 357
Lab fee $10-$15
Students may receive credit for only one of GEOG 357 and PLAN 357

GEOG 358 F 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.
Pre: ENV S 178 or consent of instructor
Lab fee $10-$15.

GEOG 359 W 2C,1L 0.5

Geography of Energy
Issues related to energy resources. The course examines both Canadian energy management problems and international issues such as cartels and relationships between energy and economic development.
Pre: GEOG 202 or consent of instructor

GEOG 360 W 1C,2L 0.5

Preparation of Maps and Illustrations
Equipment, materials and techniques involved in the practical construction of maps and cartographic illustrations. Conventional drafting and plotting procedures, symbolization of data and map editing for reproduction.
Pre: GEOG 160
Lab fee $15-$25.

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.
Pre: GEOG 275 and either GEOG 201 or EARTH 121-122 or SCI 100
Lab fee $20

GEOG 376 W,2 2C,3L 0.5

Environmental Remote Sensing
Theoretical and practical aspects of remote sensing (RS). Interaction between electromagnetic radiation, environmental media and sensors. Analysis of nonphotographic systems like RADAR and LANDSAT. Methods of RS data processing and analysis and studies of physical and human environments.
Pre: GEOG 275
Lab fee $10-$15

GEOG 381 F 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.
Pre: Third or fourth year geography students or consent of instructor

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.
Pre: Honours Geography students only

GEOG 391 F 3C 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. Fourth year General students may take this course only in fourth year.
Pre: Honours or fourth year Geography students only
Estimated cost to student: $125-$150.

GEOG 400 W 2C,2L 0.5

Climatic and Periglacial Morphology
Characteristics of the main principles of climatic and climatogenic geomorphology. Examination of processes and forms related to the periglacial environment.
Pre: One of GEOG 300, EARTH 342 or consent of instructor

GEOG 401 F 3S 0.5

Glaclial Geomorphology and Some Contemporary Applications
Glaclial and fluvio-glacial 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.
Pre: One of GEOG 300, EARTH 342
GEOG 421A F 2S 0.5
Western Europe I
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 421B W 2S 0.5
Western Europe II
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 F 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

GEOG 425 F 3C 0.5
Africa
Selected aspects of a major region with particular reference to problems of development. Normally the region will be East Africa. Selection of topics will be related to the interests of participants.
Prereq: GEOG 205

GEOG 430 F,W,S ft/dlab 0.5/1.0/1.5
Field Research in Regional Geography
430A (0.5 course credit) or 430B (1.0 course credit) or 430C (1.5 course credits).
A detailed analysis of a selected region with major emphasis upon a field examination of the region (several weeks duration).
Prereq: Third or fourth-year geography students or consent of instructor

GEOG 461 F 3C 0.5
Land Dereliction and Rehabilitation
Reasons for land dereliction, its processes, and effects. Analysis of techniques including principles from landscape architecture, ecology and post-operation areas.
Prereq: Fourth-year Environmental Studies students or consent of instructor

GEOG 470 F 2C,2L 0.75
Applied Air Photo Interpretation
Advanced air photo interpretation and its application in geomorphology, geology, resources inventory, engineering soils, hydrology and preplanning 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-$20

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 378
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 482 F 2S 0.5
Geography and Education
Prereq: Environmental Studies students in third or fourth year, or consent of instructor

GEOG 490A F,W,S 3S 0.5
Honours Thesis Preparation
Preparatory work and first draft of thesis.
Prereq: GEOG 390; only 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 0.5
Honours Thesis Completion
Completion of thesis.
Prereq: GEOG 390 and GEOG 490A; only fourth year Honours students

Geological Engineering

Professor, Chairman of the Geological Engineering Board
M.B. Dusseauit, BSc, PhD (Alberta), PE

Members of the Board of Geological Engineering

Professor, Dean of the Faculty of Engineering, Department of Civil Engineering
W.C. Lennox, BASc, MSc (Waterloo), PhD (Lehigh), PE

Professor, Chairman of the Department of Civil Engineering
R.C.G. Haus, BASc, MSc (Alberta), PhD (Waterloo), PE

Associate Professor, Chairman of the Department of Earth Sciences
J.P. Greenhouse, BASc, MSc (British Columbia), PhD (California)

Professor, Department of Civil Engineering
E.L. Mettis, BASc (Toronto), DIC, PhD (London), PE

Professors, Department of Earth Sciences
J.A. Cherry, BE (Saskatchewan), MS (California-Berkeley), PhD (Illinois), PE
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 Chemical Engineering
I. Chatzis, BASc, MASC, PhD (Waterloo), PEng

Associate Professor, Department of Earth Sciences
J.-M. Konrad, Bac, Dipl Ing (Strasbourg), MSc (Laval), PhD (Alberta), Ing.

Research Professor
J.A. Franklin, BSc, MSc, PhD (London) PEng

Adjunct Faculty
D. Best, BSc, PhD (Queen’s Kingston), PEng

Course Descriptions

GEO E 126 W 2C, 3L 0.5
Geological Engineering Concepts
An introduction to physical geology and earth processes. Geomorphology, introduction to: earth processes, geological time, including vulcanism, sedimentation, weathering, lithification, continental drift, radioactive dating, hydrogeology, pedology, resources, mass wasting, erosion.

GEO E 400F 1C, 1.4T 0.5
Geological Engineering Project I

GEO E 401 W 1C, 1.4T 0.5
Geological Engineering Project II

These two courses are designed to 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 a final 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. Under special circumstances, two suitable courses may be substituted for GEO E 400 and 401.

All other courses in the Geological Engineering program are listed under the course descriptions in Earth Sciences or Civil Engineering.

A detailed booklet describing Geological Engineering is available in Room 311, ESC building.

Course Descriptions

GERMAN

Introductory Note
Not all courses listed in this section are offered. Please consult the 1997-98 Course Offerings List or the Department for current course information.

In choosing first year courses, students should read carefully the course descriptions, consult the Department Undergraduate Officer, and check the Department’s program section.

GER 101 F, W, S 3C, 1L 0.5
First Year German
For students with little or no knowledge of German. The basic elements of grammar with an emphasis on oral practice and pronunciation. Language laboratory. Introduction to aspects of German culture and reading of appropriate graded texts.

GER 101/102 are beginners’ courses for students with little or no knowledge of German. Not open to students who have credit for GER 105, 106, 111, 112. Grade 13 or equivalent. In doubt, consult the Department.

GER 102 F, W, S 3C, 1L 0.5
First Year German
As GER 101
Prereq: GER 101

GER 105 F 3C 0.5
German for Reading Knowledge
The elements of German grammar with practice in pronunciation. Selected readings from the humanities and social sciences. This course is designed to assist undergraduate and graduate students in acquiring a reading knowledge of German.

GER 106 W 3C 0.5
German for Reading Knowledge
As GER 105.
Prereq: GER 105

GER 105/106, 111/112 are beginner courses for students with little or no knowledge of German. Not open to
### 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.

**Prerequisite:** GER 101, 102, Grade 13 or equivalent.

### GER 112 F,W,S 3C 0.5
#### First Year Scientific German
As 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.

**Prerequisite:** At least Grade 12 High School German, or equivalent

### GER 122 W 3C 0.5
#### Studies in German Literature with Language Practice
As GER 121

**Prerequisite:** GER 121, or permission of the instructor

### GER 151 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: West and East Germany, Austria, and Switzerland. Comprehensive grammar review, vocabulary building, written practice.

**Prerequisite:** At least Grade 12 High School German, or equivalent

### GER 152 W 3C 0.5
#### German Conversation and Grammar Review
As GER 151

**Prerequisite:** GER 151, 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.

**Prerequisite:** GER 102 or equivalent

### GER 202 W 3C 0.5
#### Second year German
As GER 201

**Prerequisite:** GER 201, or permission of the instructor

### GER 211 F 3C 0.5
#### Intermediate Scientific German
Grammar review and more advanced study of German structure and idioms. Reading and translating of scientific writings for vocabulary building and mastery of difficulties peculiar to technical style. Reading material is selected according to the field of the individual student.

**Prerequisite:** GER 106, 112 or equivalent

### GER 212 W 3C 0.5
#### Intermediate Scientific German
As GER 211

**Prerequisite:** GER 211

### GER 251 F 3C 0.5
#### German Conversation and Composition
This course offers extensive practice in both the spoken and written language. It provides vocabulary building, grammar review, and exercises in pronunciation and comprehension.

**Prerequisite:** GER 251 or equivalent

### GER 252 W 3C 0.5
#### German Conversation and Composition
As GER 251

**Prerequisite:** 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.).

**Prerequisite:** GER 122, 152 or equivalent

### GER 262 W 3C 0.5
#### The Age of Goethe (Romanticism)
Reading, interpretation, and critical analysis of representative works (Nestroy, Teich, Brentano, etc.).

**Prerequisite:** GER 122, 152 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**

### 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**

### 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, Bötticher, Frisch, Dürenmatt, Grass, Eich, etc.

**Prerequisite:** GER 122, 152 or equivalent

### GER 282 W 3C 0.5
#### Post-War Literature
As GER 281

**Prerequisite:** GER 122 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.

**Prerequisite:** GER 122, 152, 202 or equivalent

### GER 292 W 3C 0.5
#### Survey of German Literature
As GER 291

**Prerequisite:** GER 122 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**

**Prerequisite:** 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: GER 212 or equivalent.

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, Stifter, Gottleib, etc.).
Prereq: GER 122, 152 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, 152 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, 152 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, 152 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 Dantons Death (Büchner), Maria Stuart (Schiller), 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 3952 W 2.5
Waterloo in Germany Program
Description in Arts program section.

GER 3952 F X 0.5
"Blutezeit" in German literature (1170 to 1250); Early Minnesang, Walther von der Vogelweide, Nibelungenlied, Hartmann von Aue, Wolfram von Eschenbach, etc.

GER 441 F 3C 0.5
Humanism, Reformation and Baroque
Reading, interpretation and critical analysis of prescribed texts (Erasmus, Luther, Sachs, Opitz, Gryphius, Grimmelshausen, 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, Grammar and Composition
This course is conducted in German and 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, Grammar and Composition
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, 152 or equivalent
Offered in alternate years

GER 462 F 3C 0.5
Middle High German Literature
Reading and interpretation of samples from the major works of the MHS period, with emphasis on writers of the first "Blutezeit" in German literature (1170 to 1250); Early Minnesang, Walther von der Vogelweide, Nibelungenlied, Hartmann von Aue, Wolfram von Eschenbach, etc.

GER 471 F 3C 0.5
German Poetry
A study of the main thoughts, themes, forms and schools in German poetry from the beginning to Goethe.
Prereq: GER 122, 152 or equivalent

GER 472 W 3C 0.5
German Poetry
A study of the main thoughts, themes, forms and schools in German poetry from German Romanticism to the present.

GER 495498 F,W,S,J,A R 0.5 each
Reading Courses in Approved Topics
Prereq: Approval of the Department

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.

DUTCH 102 W 3C 0.5
First Year Dutch
As DUTCH 101
Prereq: DUTCH 101 or equivalent
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 1987-88 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

RUSS 102 W 3C,1L 0.5
First Year Russian
As RUSS 101
Prereq: RUSS 101 or equivalent

RUSS 102F 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 111 F,S 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 idioms. Readings and translation from contemporary scientific writings with the aim of 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 252 W 3C 0.5
Conversation, Composition, Grammar and Phonetics
As RUSS 251
Prereq: RUSS 251 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 0.5
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 idioms and structure as compared with the target language.
Prereq: RUSS 202 or equivalent

RUSS 312 W 3C 0.5
Theory of Translation
As RUSS 311
Prereq: RUSS 311

RUSS 341 F 3C 0.5
Russian Drama
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

RUSS 342 W 3C 0.5
Russian Drama
As RUSS 341
Taught in English.
Extra work in Russian required of Russian majors only
Open to all students
Cross-listed as DRAMA 353
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>Credits</th>
<th>Prerequisite(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RUSS 301</td>
<td>Intermediate Conversation and Composition</td>
<td>3C</td>
<td>RUSS 252 or equivalent</td>
</tr>
<tr>
<td>RUSS 352</td>
<td>Intermediate Conversation and Composition</td>
<td>3C</td>
<td>As RUSS 351</td>
</tr>
<tr>
<td>RUSS 356</td>
<td>The Stage as Forum: Russian Drama in Translation</td>
<td>3C</td>
<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, Mayakovsky, and Pogodin. Taught entirely in English. Fall term: See GE/H 355. Open to students from all departments; not normally open to first year students. Cross-listed as DRAMA 356.</td>
</tr>
<tr>
<td>RUSS 361</td>
<td>Russian Short Story</td>
<td>3C</td>
<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. Open to all students.</td>
</tr>
<tr>
<td>RUSS 381</td>
<td>The Peoples of the Soviet Union</td>
<td>3C</td>
<td>As RUSS 381. Open to all students.</td>
</tr>
<tr>
<td>RUSS 382</td>
<td>The Peoples of the Soviet Union</td>
<td>3C</td>
<td>As RUSS 381. Open to all students.</td>
</tr>
<tr>
<td>RUSS 385</td>
<td>Great Russian Novels</td>
<td>3C</td>
<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>
</tr>
<tr>
<td>RUSS 391</td>
<td>Great Russian Novels</td>
<td>3C</td>
<td>Reading and interpretation of 19th- 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>
</tr>
<tr>
<td>RUSS 411</td>
<td>East Slavic Epic Tradition</td>
<td>3C</td>
<td>A study of the origins and development of the epic tradition in East Slavic Literature. Taught in Russian. Open to all students.</td>
</tr>
<tr>
<td>RUSS 421</td>
<td>Russian Epic Tradition</td>
<td>3C</td>
<td>As RUSS 441. Taught in English. Open to all students.</td>
</tr>
<tr>
<td>RUSS 441</td>
<td>Russian Epic Tradition</td>
<td>3C</td>
<td>As RUSS 441. Taught in English. Open to all students.</td>
</tr>
<tr>
<td>RUSS 451</td>
<td>Advanced Conversation, Grammar and Composition</td>
<td>3C</td>
<td>This course is conducted in Russian and provides intensive practice in spoken and written Russian on the advanced level. Taught in English. Extra work in Russian required of Russian majors only. Open to all students.</td>
</tr>
<tr>
<td>RUSS 461</td>
<td>Twentyfirst Century Russian Literature</td>
<td>3C</td>
<td>As RUSS 451. Taught in English. Extra work in Russian required of Russian majors only. Open to all students.</td>
</tr>
<tr>
<td>RUSS 471</td>
<td>Russian Poetry</td>
<td>3C</td>
<td>A study of themes and forms of representative authors from Symbolism to the present (Blokh, Esenin, Mayakovsky, Akhmatova, etc.). Prereq: RUSS 102 or equivalent.</td>
</tr>
<tr>
<td>RUSS 485</td>
<td>History of Russian Literature</td>
<td>3C</td>
<td>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.</td>
</tr>
<tr>
<td>RUSS 496</td>
<td>History of Russian Literature</td>
<td>3C</td>
<td>This second part deals with Russian literature up to the present. 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.</td>
</tr>
<tr>
<td>RUSS 498</td>
<td>Reading Courses in Approved Topics</td>
<td>F,W,S</td>
<td>Prereq: Approval of the Department.</td>
</tr>
</tbody>
</table>
Course Descriptions

Germanic and Slavic

POLISH

POLSH 101 F 3C 0.5
First Year Polish
The fundamentals of Polish grammar are taught with emphasis on oral practice and pronunciation. An introduction to Polish culture is given as well.
Taught in English
Open to all university students with little or no knowledge of Polish.

POLSH 102 W 3C 0.5
First Year Polish
As POLSH 101
Prereq: POLSH 101 or equivalent

Intermediate Polish

This course will be conducted largely in Polish and provides intensive practice in grammar, composition and conversation.
Prereq: POLSH 102 or equivalent

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 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)
Ukrainian 272 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. Korotych, and others).
Taught in English
Open to all students

UKRAN 271 F 3C 0.5
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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
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.

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.

Epidemiology of Aging
Factors contributing to various disease processes, with special reference to quantitative evaluation of environmental factors relevant to human disease and aging.

Topics in Mathematical Aspects of Chemistry, Biology and the Medical Sciences
Topics will be selected from the area of epidemiology and mathematical models of disease processes with special reference to heart disease and cancer.

Course Descriptions

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 HLT 140 and/or 141 may not take this course for credit

Introduction to Health Studies 2
The same as HLT 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 HLT 140 and/or 141 may not take this course for credit

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: HLT 101
Cross-listed as KIN 210
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, behavioural, 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

Community Health
This course examines the Canadian health care system by considering organizational principles, health resources and economics, 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

Environmental Health
An introduction to the basic biological and toxico logical 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

Disease Process
An introduction to the study of biological factors governing the occurrence of disease in human populations, using selected diseases to illustrate disease mechanisms and identification of risk factors.
Prereq: BIOI 230, 233, KIN 317 or equivalent

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

Nutrition
An elementary course in nutrition with special emphasis on diet for sport and certain physiological conditions.
Cross-listed as KIN 346

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

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 KIN 349

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 organs systems (e.g., nervous system, immune system, etc.) are also examined.
Prereq: HLTH 340, or permission of instructor

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

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.

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.

Epidemiology of Chronic Diseases
An investigation of the epidemiology of selected non-communicable diseases. The course emphasizes understanding of epidemiologic methods and identification of risk factors.
Prereq: An introductory statistics course or consent of instructor

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
Department of History

Associate Professor, Chairman of the Department
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. Craton, BA (London), MA, PhD (McMaster) PhDHistS
L.T. Guelke, BSc (Cape Town), MA (York), PhD (Toronto)
P.J. Harrigan, BA (Detroit), AM, PhD (Michigan)
J.F.H. New, BA, MA (Melbourne). PhD (Toronto), PhDHistS

Associate Professors
J.R. English, BA (Waterloo), AM, PhD (Harvard)
F. C. Gérard, MA (Collège St. Dominique, France), BD, STM (McGill), PhD (Hartford, Conn.)
P.S. Johannesen, BA (Evangel College), MA, PhD (Missouri)

R.C. Macgillivray, BA (Queen's) AM, PhD (Harvard)
K.M. McLaughlin, BA (Waterloo), MA (Dalhousie), 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 (Bethel College), MA (Minnesota), PhD (Princeton) G
J.A. Waltz, CR, BA (Western Ontario), MA, PhD (St. Louis) J
J.W. Walker, BA (Toronto), MA (Waterloo), PhD (Dalhousie)

Assistant Professors
D.J. Horton, BA (Waterloo Lutheran), MA (Waterloo), PhD (McGill)
H.A. MacDougall, BA, MA, PhD (Toronto)
K.J. MacHardy, BA, MA (Western Ontario), PhD (Berkeley)
C.A. Snyder, BA (Waterloo), MA, PhD (McMaster), G
G.J. Stortz, BA, MA (Waterloo), PhD (Guelph), J
D.E. Wright, BA (Cambridge), MA, PhD (McMaster)

Adjunct Faculty
R.P. Fuks, BA (Toronto), MA (Maryland), PhD (Chicago)
W. Klassen, BA (McMaster), DPhil (Oxford) G
J.O. Stubbs, BA (Toronto), MSc (Econ) (London), DPhil (Oxford)

Faculty Member holding cross appointment to History from:
"Geography
G refers to faculty members at Conrad Grebel College
J refers to faculty members at St. Jerome's College
P refers to faculty members at St. Paul's College
R refers to faculty members at Renison College

Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

Introductory Notes

100 Level: Introductory Courses.
For First Year Arts students and for all other students interested.

200-249: Survey Courses.
Primarily intended for non-History Majors, but open to History Majors.

250-299: Foundation Courses
Primarily intended for History Majors, but open to non-History majors whether or not they have previously taken a history course.

300 Level: Special Topics Courses
Primarily intended for History Majors, but open to all students who have previously taken a history course.

400 Level: Senior Seminars
Intended for senior History Honours students.

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 102D W 0.5
From Nationalism to Totalitarianism
The growth of nationalism and nation states since the French Revolution with attention to the Industrial Revolution, the World Wars, Fascism, Nazism and Stalism.

HIST 102E F,W 0.5
Canadian History
Selected major themes from pioneer life to Canadian involvement in 20th century wars.
Also offered at St. Jerome's College
HIST 102F W 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. Sarte, Shakespeare to Marx and Freud.

HIST 102H F 0.5
Early Modern Europe
This course will survey the chief features of early modern European society. Topics will include the Renaissance and Reformation, Old Regime society, the scientific revolution, the Enlightenment and the French Revolution.

HIST 102K W 0.5
Conflict in the Caribbean and Central America
A study of the historical origins and nature of contemporary problems in the Caribbean and central America.

HIST 102M W 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 102N W 0.5
An Introduction to African History
A survey of African history from ancient times through the colonial interlude to the emergence of modern nations.

HIST 102P W 0.5
Nationalities in Eastern Europe Since 1914
This course will examine the problems and possibilities posed by the emergence of national movements and independent nation-states in Eastern Europe in connection with the decline and fall of the Ottoman, Russian and Austrian Empires at the beginning of the twentieth century.

HIST 130 F.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 interpretative 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 202X W 0.5
The Individual and the Family in History
A survey of the changes in the quality and structure of life with emphasis on love, marriage and the family in the West since the nineteenth century.

HIST 204X W 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 206X F 0.5
History of Canadian Minorities
An introduction to the history of selected racial and regional minorities in Canada. The course examines the emergence of minority communities, and their position in modern Canadian society.

HIST 207X W 0.5
Canadian Labour History
This course deals with the history of organized labor in Canada with an emphasis on prominent labour leaders, major industrial disputes and labour's role in politics. It will also evaluate the development of the Canadian industrial relations system. Offered at St. Jerome's College.

HIST 208 W 0.5
The Cold War: American-Russian Relations Since November, 1917
Traditional and radical historians examine the Cold War: American-Russian rivalry, 19th century, Wilson vs. Lenin; F.D.R., Truman and Stalin; containment, coexistence, and the politics of crisis from 1945 to the present.

HIST 209 W 0.5
Health, Disease and Medicine in Canadian History, 1800-1984
Starting with Amerindian medicine, the course will examine topics such as the rise of the medical and nursing professions, changing public attitudes to health and disease, and the evolution of the Canadian health insurance system.

HIST 210X 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 1803
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 213X F 0.5
Modern Western Popular Culture
This course examines historically the formation of a distinct modern western popular culture, looking primarily at Britain, France, Canada and the United States from around 1850 to the present, and emphasizing such aspects as: industrialism and leisure, the family and sexual attitudes, religion and popular belief, education and literacy, drinking habits, organized sport and mass entertainment.

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 216 F 0.5
Irish History: Achievement, Unification, Revolt
Political, social and religious history of Ireland from the beginning of the golden age of Irish medieval civilization to the Act of Union, c.400 to 1800.

HIST 217 W 0.5
Irish History: The Nineteenth and Twentieth Centuries
Political, social and religious history of Ireland emphasizing social change, the struggle for home rule and the Republic, 1880 to present.
HIST 221 W 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 F 0.5
History of Modern Revolutions
An introduction to historical explanations 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 230 F 0.5
Church and Revolution in Latin America
A study of the relationship between church and political systems and movements in Latin America. The course will focus on contemporary revolutionary political movements in Latin America and the newly-defined role of the church as a force for human liberation.
Offered at Conrad Grebel College.

HIST 234 W 0.5
The Catholic Church in Canada Since Confederation
An examination of the Catholic Church in Canada since Confederation, with an emphasis on social and political influences.
Offered at St. Jerome's College.

HIST 235 F 0.5
History of Christianity
The development of Christianity in its Roman Catholic, Eastern Orthodox and Protestant tractions from the time of Christ to the present.
Offered at Conrad Grebel College
Cross-listed as R S 230

HIST 237 F 0.5
Ancient Civilization 1
A study of the civilizations of the Ancient Near East focusing on Mesopotamia (Sumer and Akkad, the Babylonian Dynasty and the Third Dynasty of Ur), Hatti, Assyria, Egypt and Persia.
Offered at St. Jerome's College.

HIST 238 W 0.5
Ancient Civilization 2
An introduction to the social, political and cultural history of Rome in its development from a Republic to an Empire. Special attention will be placed on the sources of political power.
Offered at St. Jerome's College.

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 her to the present status of a powerful Asian nation.

HIST 241 F 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 245 F 0.5
Religious and Cultural Minorities in Canada
A comparative study of the cultural and political conflicts with society and state of such ethnic and religious minorities as Doukhobors, Hutterites, Jehovah's Witnesses, Jews, and Mennonites (including the Amish). Emphasis on 20th century.
Offered at Conrad Grebel College.

HIST 247 W 0.5
Mennonite History: A Survey
This course covers Mennonite origins, teachings, migrations, settlement patterns, divisions, leaders, institutions, and religious and social practices, as well as facets of Mennonite history in various national settings.
Offered at Conrad Grebel College.

HIST 248 F 0.5
History of Canadian-American Relations to 1914
An examination of the history of relations between the two countries until 1914. Topics of a political, economic, social and cultural nature will be studied.
Offered at St. Jerome's College.

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 251 X F 0.5
History of Medieval Europe 814-1303
The political, cultural, economic and ecclesiastical development of Europe from Charlemagne to Philip IV of France.
Offered at St. Jerome's College.

HIST 252 X W 0.5
Enlightenment and Revolution in Europe (1750-1870)
This course examines the relationship between ideas and institutions. It will focus on topics such as the Enlightenment, Romanticism, Marxism and Nationalism, and consider the impact of these movements on the various revolutions of the period (and vice versa).

HIST 253 X F 0.5
Canadian History: The British Period
The evolution of Canadian society in the face of dominant British and American influences.
Offered with St. Jerome's College.

HIST 254 X W,S 0.5
Canadian History: The National Period
This course studies the development of Modern Canada. Themes of the course include immigration, industrialization, feminism, labour unrest, and regionalism.
Offered with 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 settlement 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
History of the United States since 1860
A survey of American society, politics and thought and of the relations of the United States with the outside world from 1865 to the present.
HIST 300 W 0.5
The Idea of History
The course is an introduction to the Philosophy of History and to the art of historical writing. It deals with the great theoretical issues influencing historical analysis and with the classics of historical literature. It is equally concerned with the practical problems of historical research.

Highly recommended for Year Three History majors.

HIST 305 F 0.5
The English Reformation
A history of the English reformation, expansively considered from the beginnings of the European Reformation to the establishment of the Anglican Church in the Revolutionary and Restoration periods in the 17th century.

HIST 307 F 0.5
British History 1780-1867
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 320 F 0.5
The History of Modern Quebec
The course will treat the history of Quebec from 1667 to the present. Nationalism, separatism, language and cultural problems, economic and social issues are all examined in their historical context.

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 329 W 0.5
History of the Common Law
The emphasis will be on the early development of the common law in England.

Offered at St. Jerome's College.

HIST 339 W 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.

Offered at Conrad Grebel College.

HIST 346 W 0.5
Mennonite History: Special Topics
Special issues examined in historical context include church/state conflicts in education, conscroption and social policies, and such phenomena as nonconformity, internal divisions, organizational proliferation, theological shifts, changing forms of leadership and issues of identity.

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.

Cross-listed as R S 322

HIST 350 W 0.5
West Indian History
A study of the Caribbean region from aboriginal times, including European imperialism, the history of plantations, slavery and slave society, independence movements, and the problems posed by modernization, underdevelopment and neo-colonialism.

HIST 355 F 0.5
Russian History 1813-1825
The course will focus on selected themes in the development of the Russian state and society from the beginning of Romanov rule to the middle of the 19th century.

HIST 356 W 0.5
Russian History since 1825
The course will focus on selected themes in Russia's development in the 19th and 20th centuries, including the Soviet period.

HIST 377 W 0.5
The Historian and the Computer
This course will introduce students to quantitative analysis of historical data. After a brief introduction to basic SPSS statistical programs, students will develop a research scheme and analyze machine-readable historical data.

HIST 379 F 0.5
Reformation History
An analysis of the economic changes, the rise of "new monarchs," the nature of and effect of the "religious reformations," the expansion of Europe to the "new world" with their implications for 16th century Europe.

Offered at Conrad Grebel College.

HIST 386 F 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 growth of Ontario from a pioneer settlement, with particular emphasis on economic, social, political and cultural aspects of change. An emphasis will also be placed on the sources and methods of local historical research.

HIST 398 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 399 W 0.5
Seven Faces of Evil
A study of some of the major visions of evil in the West and their consequences in politics, economics, science and religion.

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 antebellum South, the Civil War and reconstruction, the New South, the "lost cause," the era of Jim Crow, and the search for the central theme.
HIST 397 F 0.5
Directed Studies in Special Topics
Study in a limited field under tutorial guidance. A high standard of written work will be expected.
Prereq: Honours History standing and permission of the instructor
Not available to students with credit for 399A or B.

HIST 398 W 0.5
Directed Studies in Special Topics
Study in a limited field under tutorial guidance. A high standard of written work will be expected.
Prereq: Honours History standing and permission of the instructor
Not available to students with credit for 399A or B.

All 400 courses are designed for fourth-year Honours students. They are research seminars. History majors must consult Departmental listings in advance when selecting their fourth-year seminars.

HIST 401A/B 0.5/0.5
European
A letter grade for HIST 401A will be submitted only after completion of HIST 401B.

HIST 403A/B 0.5/0.5
Canadian
A letter grade for HIST 403A will be submitted only after completion of HIST 403B
Offered at St. Jerome's College

HIST 405A/B 0.5/0.5
British
A letter grade for HIST 405A will be submitted only after the completion of HIST 405B.

HIST 407A/B 0.5/0.5
Imperial
A letter grade for HIST 407A will be submitted only after the completion of HIST 407B.

HIST 409A/B 0.5/0.5
American
A letter grade for HIST 409A will be submitted only after the completion of HIST 409B

HIST 435A/B 0.5/0.5
Ethno-History
A letter grade for HIST 435A will be submitted only after the completion of HIST 435B

HIST 453A/B 0.5/0.5
20th-Century International History
A letter grade for HIST 453A will be submitted only after the completion of HIST 453B

COURSES NOT OFFERED 1987-88
HIST 102B Imperialism in the 20th Century
HIST 102J Asian History
HIST 201X Canadian Urban History
HIST 203X Modern Quebec
HIST 212 British History Since 1603
HIST 214X Empires and Missionaries
HIST 218 German History 1740-1945
HIST 219 Local History in Ontario
HIST 223 Revolutions in Latin America
HIST 223 Civil-Military Relations in Latin America
HIST 249 History of Canadian-American Relations since 1914
HIST 258 The British Empire and Commonwealth
HIST 257 History of the United States until 1865
HIST 302 Medieval Church History 312-1096
HIST 303 Medieval Church History 1096-1449
HIST 311 Western European Cultural History 1600-1950
HIST 319 French-Canadian History
HIST 323 The United States in World Affairs
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
HIST 378 The Italian Renaissance

HIST 398 W 0.5
Directed Studies in Special Topics
Study in a limited field under tutorial guidance. A high standard of written work will be expected.
Prereq: Honours History standing and permission of the instructor
Not available to students with credit for 399A or B.

All 400 courses are designed for fourth-year Honours students. They are research seminars. History majors must consult Departmental listings in advance when selecting their fourth-year seminars.

HIST 401A/B 0.5/0.5
European
A letter grade for HIST 401A will be submitted only after completion of HIST 401B.

HIST 403A/B 0.5/0.5
Canadian
A letter grade for HIST 403A will be submitted only after completion of HIST 403B
Offered at St. Jerome's College

HIST 405A/B 0.5/0.5
British
A letter grade for HIST 405A will be submitted only after the completion of HIST 405B.

HIST 407A/B 0.5/0.5
Imperial
A letter grade for HIST 407A will be submitted only after the completion of HIST 407B.

HIST 409A/B 0.5/0.5
American
A letter grade for HIST 409A will be submitted only after the completion of HIST 409B

HIST 435A/B 0.5/0.5
Ethno-History
A letter grade for HIST 435A will be submitted only after the completion of HIST 435B
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 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 instructor

ITAL 312 W 3C 0.5
**Renaissance Italian Literature**
An introduction to the Italian literary production of the 16th and 17th centuries, focusing on selections from the major works of the period, including some by Machiavelli, Ariosto and Tasso.
Prereq: ITAL 191/192 or consent of instructor

ITAL 351 W 3C 0.5
**Italian Stylistics**
An introduction to the study of stylistics and syntactical structures of the Italian language in written and oral expression.
Prereq: ITAL 251, 252 or consent of the instructor

ITAL 392 W 2S 0.5
**Modern Italian Poetry**
A survey of the major Italian poets from the Futurists through to Montale and their influence on European poetry.
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 1997-98**
ITAL 391 The Modern Italian Novel

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**Department of Kinesiology**

**Associate Professor, Chairman of Department**
P.J. Bishop, BSc, BPE (Waterloo), MSc (McMaster), PhD (Minnesota)

**Professor, Dean of the Faculty of Human Kinetics and Leisure Studies**
R.G. Marteniuk, BPE (McMaster), EdD (Pennsylvania State)

**Professor, Associate Dean, Graduate Affairs, Faculty of Human Kinetics and Leisure Studies**
M.E. Houston, BSc (Waterloo), PhD (Waterloo)

**Associate Professor, Associate Chairman, Graduate Affairs**
F. Allard, BA, BPE, PhD (Waterloo), Recipient of the Distinguished Teacher Award

**Associate Professor, Associate Chairman, Undergraduate Affairs**
I.D. Williams, MS, PhD (Illinois)

**Associate Professor, Head of School of Anatomy**
D.A. Ranney, BA, MD (Toronto), FRCS (England)

**Professors**
N.J. Ashton, BSc (McGill), MS (Michigan)
H.V. Green, BA, BPH (O ueen's), MA (Alberta), PhD (Wisconsin)
B.D. McPherson, BA, MA (Western Ontario), PhD (Wisconsin)
R.W. Norman, BA, BPE (McMaster), MSc (Alberta), PhD (Pennsylvania State)
D.A. Winter, BSc, MSc (Queen's), PhD (Dalhousie)

**Associate Professors**
L.R. Brawley, BPE (Calgary), MSc (Pennsylvania State)
N. Charness, BA (McGill), MS, PhD (Carnegie-Mellon)
J.E. Curtis, BA, (Sir George Williams) MA (Central Michigan), MA (Cornell)
R.L. Hughson, BSc (Western Ontario), MSc (British Columbia), PhD (McMaster)
M.T. Sharratt, BA, MA (Western Ontario), PhD (Wisconsin)
N. Theberge, BA (Massachusetts), MA (Boston), PhD (Massachusetts)
J.A. Thomson, BA, MSc (McMaster), PhD (Waterloo)
W.N. Widmeyer, BA (Western Ontario), BPE (McMaster), BPE (California), PhD (Illinois)

**Assistant Professors**
J.S. Frank, BSc, MSc (Waterloo), PhD (Southern California)
C.L. MacKenzie, BSc, MSc, PhD (Waterloo)
A.E. Patla, BTECH (Indian Institute of Technology), MSc Eng (New Brunswick), PhD (Simon Fraser)
R. Wells, BSc (Manchester), MEng (McMaster), PhD (Manchester)

**Adjunct Faculty**
J.A. Israel, MD (Toronto), FRCS (Canada)
D.R. McTavish, MD (Western Ontario), FRCS
G.H. Mann, MB, BS (London), DRCOG (London)
E.A. Roy, BSc (Waterloo), MPE (British Columbia), PhD (Waterloo)

**Senior Demonstrators**
L.L. Jones, BSc, MSc (Waterloo)
D.C. Painter, BA (Queen's), MSc (Waterloo)
J.C. Pezzack, BSc, MSc (Waterloo)
H.E. Scoggan, BA, MSc (Queen's)

**Faculty Members of Kinesiology holding cross and/or joint appointments to:**
1. Sociology
2. Psychology
3. Systems Design
4. Recreation and Leisure Studies
5. Optometry
Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

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.

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.

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.

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.

KIN 225 W 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, cardio-vascular and respiratory disease.

KIN 242 W 3C,2L 0.5
Introduction to Movement Disorders
An introduction to the characteristics, processes and problems of sport as a social system. In addition, the social psychological aspects of sport involvement are considered.

KIN 245 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.

KIN 250 F 3C 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.

KIN 271 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 281 W 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 biostatics and biodynamics of linked segment models of human motion are introduced.

KIN 300 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.

KIN 301 W 3C,2L 0.5
Evaluation of Human Motor Performance
The nature and methodology of assessment is reviewed from theoretical and empirical perspectives. Taxonomies of motor performance are examined and principles developed for the measurement of specific constructs in field and laboratory situations.

KIN 303 W,S 3C,2L 0.5
Introduction to Sports Medicine
An introductory course to the area of sports medicine, including the prevention, care and rehabilitation of common sports injuries. Considerable attention is directed towards the mechanisms of traumatic injuries as well as the management in the acute, intermediate and advanced stages of injury care.

KIN 317 W 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

Facility Members holding cross and/or joint appointments to Kinesiology from:
7Sociology
#Psychology

Course Descriptions
Kinesiology

Prereq: KIN 103 and PSYCH 101
Cross-listed as REC 203 and SOC 348

Prereq: KIN 200 or consent of instructor

Prereq: KIN 200, BIOL 230 and 233
Cross-listed as HLTH 210
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).
Prereq: PSYCH 101 or consent of instructor
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

KIN 352 F 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 one other SOC course
Cross-listed as SOC 344

KIN 354 W, S 2C, 1T 0.5
Social Psychology and Physical Activity
An examination of sport and other forms of physical activity as social situations. Topics such as social facilitation, modelling, person perception, expectancies, group structure, unity, motivation, leadership, conformity, and intergroup relations are introduced in relation to motor performance.
Prereq: PSYCH 101
Cross-listed as REC 307

KIN 366 F 3C 0.5
Information Processing in Human Perceptual Motor Performance
An information processing model of perceptual/motor behaviour is presented. Human-performance theory is used to study processes mediating input and output information. Specifically, the subprocesses of storage of information in memory, perception, retrieval of information from memory and execution of movement are examined.
Prereq: KIN 222, 255

KIN 357 W 3C 0.5
Motor Learning
A course focused on the bases and applications of theories of motor learning. Included are selected psychological and neurophysiological processes as they relate to these theories.
Prereq: KIN 222, 255

KIN 401 W, S 3C, 2L 0.5
Physiological Adaptations to Physical Activity
An analysis of the physiological adaptations that occur in response to protracted physical activity and the influence of such adaptations on the response to work in a variety of environmental conditions. Special emphasis is given to the changes occurring in skeletal and cardiac muscles and the neuro-endocrine mechanisms involved.
Prereq: KIN 300 and 317

KIN 402 F 3C 0.5
Hydro space, Attitude and Aerospace Physiology
An examination of man’s cardiorespiratory responses at rest and during work in selected stresses of hyperbaric and hypobaric environments.
Prereq: KIN 300

KIN 405 W 3C, 2L 0.5
Exercise Management
An examination of the rationale and procedures used in the development of exercise programs for normally healthy individuals.
Prereq: KIN 300 and 321

KIN 407 W 3C 0.5
The 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 equivalent
Cross-listed as HLTH 407

KIN 416 W 3C 0.5
Neuromuscular Integration
An examination of the neural processes involved in the maintenance of posture and the control of movement.
Prereq: KIN 201 or PSYCH 261 or consent of instructor

KIN 420 W 3C 0.5
Occupational Biomechanics
Biomechanical methods are applied to the study of the effect on the human operator of selected work place tasks, personal equipment, and work space layout. Examples include the use of EMG and/or computerized models to analyze low back loading during manual lifting, the design of helmets, shoes and office chairs.
Prereq: KIN 425 (may be taken concurrently) or consent of instructor

KIN 425 W 3C, 2L 0.5
Biomechanics of Human Movement
The quantitative measurement and analysis of the movement of the human musculo-skeletal system. Multisegment dynamic movements will be studied using existing computer programs, with emphasis on kinematics, kinetics and energetics, as well as the use of EMG in the assessment of the control of the movement. Examples are presented from pathological, normal and athletic movement.
Prereq: KIN 321

KIN 426 F 3C, 2L 0.5
Biophysical Signal Processing and Control Systems
Basic electricity and electronics required for the understanding of bioelectric recording and electrophysiology. Application of signal processing to biophysical signals encountered in kinesiology. Mathematical modelling of passive and active systems and the control systems (cardiac, respiratory, neuromuscular) associated with human movement.
Prereq: KIN 321, KIN 300, KIN 357 or consent of instructor

KIN 431 F, W, S 0.5
Research Proposal
An independent paper in the form of a research proposal on an approved topic. The topic may include survey, field, laboratory, theoretical, or applied research, program evaluation, mathematical modelling, fitness appraisal, etc. The format is to be determined with the supervisor and may be in chapters or in journal style.
Prereq: Fourth year Honours Kinesiology

KIN 431A Biomechanics
KIN 431B Biochemistry
KIN 431C Work Physiology
KIN 431E Psycho Motor Behaviour
KIN 431G Sociology of Sport and Physical Activity
KIN 431J Psychology of Human Movement
KIN 431K Sports Medicine
KIN 431M Anatomy
KIN 431N Movement Disorders
KIN 431O Motor Control
KIN 431P Nutrition
KIN 431Q Gerontology

KIN 432 F.W.S 0.5
Research Project
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 format is to be determined with the supervisor and may be in chapters or in journal style.

Prereq: KIN 431

It is strongly recommended that students planning graduate studies take KIN 431 and KIN 432.

KIN 432A Biomechanics
KIN 432B Biochemistry
KIN 432C Work Physiology
KIN 432E Psycho-Motor Behaviour
KIN 432G Sociology of Sport and Physical Activity
KIN 432J Psychology of Human Movement
KIN 432K Sports Medicine
KIN 432M Anatomy
KIN 432N Movement Disorders
KIN 432O Motor Control
KIN 432P Nutrition
KIN 432Q Gerontology

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.

Prereq: Fourth year Honours Kinesiology

KIN 433A Biomechanics
KIN 433B Biochemistry
KIN 433C Work Physiology
KIN 433E Psycho-Motor Behaviour
KIN 433G Sociology of Sport and Physical Activity
KIN 433J Psychology of Human Movement
KIN 433K Sports Medicine
KIN 433M Anatomy
KIN 433N Movement Disorders
KIN 433O Motor Control
KIN 433P Nutrition
KIN 433Q Gerontology

KIN 452 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 252 or REC 203 or SOC 348

KIN 453 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 456 F 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 366

KIN 470 F.W.S 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 472 F.W.S 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,S ST 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 cardiopulmonary implications of exercise and behaviour modification.

Prereq: KIN 301, 401, 448, and experience with high risk patients, plus consent of instructor

Courses may be taken concurrently.

COURSES NOT OFFERED 1987-88
KIN 402 Hydrospace, Altitude and Aerospace Physiology

PHYSICAL ACTIVITY COURSES
The Department of Kinesiology ceased to offer physical activity courses in September 1986. For students planning to teach Physical and Health Education, an arrangement has been made for physical activity courses to be taken at Wilfrid Laurier University. For further information on this, please contact Sheila Cook, Academic Services Officer, Department of Kinesiology.
Department of Management Sciences

Professor, Chairman of the Department
M.J. Magazine, BS (City College of New York), MS (New York University), MEng, PhD (Florida), PEng

Professor, Graduate Officer, Acting Chairman
D.W. Conrath, BA (Stanford), MS (Carnegie Tech), MA, PhD (California-Berkeley), PEng

Professor, Associate Chairman, Undergraduate Officer
G.N. Souls, BASc (Toronto), PEng

Professors
J.A. Buzacott, BSc, BE (Sydney), MSc, PhD (Birmingham)
F.E. Burke, BA (London), PEng
S.D. Saleh, BA (Cairo), MA, PhD (Case Western Reserve)

Associate Professors
I. Bernhardt, BA (New York), PhD (California-Berkeley)
J.H. Bookbinder, MBA (Toronto), MS, PhD (California-San Diego)
G.R. Sullivan, BASc (Waterloo), DSc, PhD (London), PEng (DuPont-NSERC)
R.G. Vickers, BSc (British Columbia), PhD (Massachusetts Institute of Technology)

Assistant Professors
G.W. Blazenko, BA (Simon Fraser), MA (Western Ontario), PhD (British Columbia)
K.B. Cameron, BSc (Regina), MMath, PhD (Waterloo)
N.M. Fraser, BASc, MASc, PhD (Waterloo), PEng
J.D. Fuller, BSc (Queen's), MSc, PhD (British Columbia)
V. Mason, BASc, MASc (Toronto), PhD (Waterloo), PEng
F. Safeyen, BS (Idaho), MSc, PhD (Victoria)

Lecturer
E.M. Jiewke, BSc (St. Francis Xavier), MBA (Calgary)

Associate Director of Waterloo Management of Integrated Manufacturing Systems Research Group (WATMIMS)
K.N. McKay, BMath (Waterloo)

Faculty Member of Management Sciences holding cross appointment to:
1. Systems Design Engineering
2. Department of Combinatorics and Optimization

Faculty Members holding cross appointments to Management Sciences from:
3. Chemical Engineering
4. School of Accountancy

Course Descriptions

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.

Prereq: M SCI 251 or equivalent

M SCI 251 F,W 3C 0.5 Probability and Statistics 1

M SCI 251 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 S 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.

M SCI 432 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.

M SCI 452 W 2C,1T 0.5 Behavioural Decision Analysis
This course concerns decision making processes within organizations at the individual and group levels. Topics include goals and the measurement of utility; decisions without probabilities and uncertainty reduction; incentives and contributions; and multiple-criteria methods.

M SCI 461 S,F 2C,1T 0.5 Managerial and Engineering Economics 2

M SCI 461 S,F 2C,1T 0.5 Managerial and Engineering Economics 2

Prereq: M SCI 251 or equivalent
Faculty of Mathematics

Dean of the Faculty of Mathematics
J.G. Kalbfleisch, BSc (Toronto), MA, PhD (Waterloo)

Associate Dean, Graduate Studies
L.B. Richmond, BSc, MSc (Manitoba), PhD (Alberta)

Associate Dean, Undergraduate Studies
V.A. Dyck, BMath, MMath (Waterloo)

Associate Dean, Computing; Director, Mathematics Faculty Computing Facility
J.W. Wong, BS, SM, PhD (California-Los Angeles)

Assistant Dean for External Programs
R.G. Dunkley, BA (Western Ontario)

Associate Professor, Faculty of Mathematics, Director of Undergraduate Affairs
P.C. Brillinger, BA (McMaster), MA (Waterloo)

Director, Statistical Consulting Service
K.S. Brown, BMath, PhD (Waterloo)

Director, University of Waterloo Institute for Computer Research
J.I. Munro, BA (New Brunswick), MSc (British Columbia), PhD (Toronto)

Lecturers, Faculty of Mathematics
L.E. Davidson, BSc (Toronto)
B.A. Ferguson, BMath (Waterloo)
R.G. Scoines, BA (Western Ontario), MMATH (Waterloo)

Special Lecturer and Resident Counsel in Mathematics and Engineering
R.G.R. Lawrence, QC

DEPARTMENT OF APPLIED MATHEMATICS

Professor and Chairman of the Department
C.B. Collins, BSc (London), PhD (Cambridge)

Professor, Associate Chairman, Graduate Officer
J. Wainwright, BSc (Natal), PhD (South Africa), Recipient of the Distinguished Teacher Award

Assistant Professor and Associate Chairman, Undergraduate Affairs

Professor, Associate Chairman, Graduate Officer
J. Wainwright, BSc (Natal), PhD (South Africa), Recipient of the Distinguished Teacher Award

Assistant Professor and Associate Chairman, Undergraduate Affairs

B.J. Marshman, BSc, MSc, PhD (Waterloo)

Professors
R.H. Bartels,5 MS (Michigan), PhD (Stanford)
J. Czek,1 RNDr (Charles University, Prague), CSc (Czechoslovak Academy of Sciences, Prague)
H.F. Davis, SB, SM, PhD (Massachusetts Institute of Technology)
S.G. Davison,2 BSc, MSc, PhD, DSc (Manchester), FInstP
B. Forte, PhD, DSc (Pisa), Habil (Rome)
J.A. George,6 MSc (Alberta), PhD (Stanford), (on leave)
G.M.L. Gladwell,5 BSc, PhD, DSc (London)
F.O. Goodman,7 BSc, PhD, DSc (London), FInstP, FAIP
W.H. Hsu,3 BSc (Peking), PhD, DSc (Southampton)
J.D. Lawson,3 BSc(Toronto), PhD (Waterloo), FIMA
F.R. McCourt,5 BSc, MSc, PhD (British Columbia)
I.J. McGee, BASc (Toronto), MSc (Waterloo), PhD (Yale)
M.A. McKernan, BS, MA (Loyola), PhD (AT)
R.G. McLennan, BSc, MSc (Queens), PhD (Cambridge)
J.I. Morris,4 BSc (Leicester), PhD (St. Andrews), (on leave)
J. Paluda,1 RNDr (Charles University, Prague), CSc (Czechoslovak Academy of Sciences, Prague)
P.J. Ponzo, BASc, MA (Toronto), PhD (Illinois)
C. Rogers, BA (Oxford), MEd (Toronto), MSc, PhD (Nottingham), FIMA FInstP
R.B. Simpson,4 BSc, MASc (Toronto), PhD (Maryland)

Associate Professors
C.F.A. Beaumont, BA (McMaster), MA (Toronto)
J. Froese, BA (Manitoba), MA (Queens), PhD (British Columbia)
K.O. Geddes,4 BA (Saskatchewan), MSc, PhD (Toronto)
G.J. Lastman, BASc, MA (British Columbia), PhD (Texas)
S.P. Lipshitz,5 BSc (Natal), MSc (South Africa), PhD (Witwatersrand)
W.F. Shaddock,7 BSc, MSc (Western Ontario), PhD (London), NSERC University Research Fellow
G. Tenti, Laurea (Rome), MSc, PhD (Toronto)
R.A. Wentzel, BSc (Acadia), MSc, PhD (Western Ontario)

Assistant Professors
D. Siegel, BA (L.U.C.L.A.), PhD (Stanford)
M.E. Snyder, BSc (Western Ontario), MSc (Waterloo)

V.M. Zeidan, BSc (Beirut), MA (Dalhousie), PhD (British Columbia)

Research Assistant Professors
N. Kamran, lic math. (Brussels), PhD (Waterloo), NSERC University Research Fellow
E.R. Vrscay, BSc, MMath, PhD (Waterloo), NSERC University Research Fellow

Adjunct Faculty
W.F. Ames, MS (Wisconsin)
D.G. Crighton, BA, MA (Cambridge), PhD (London)
M.A. Donelan, PhD (British Columbia)
W.F. Langford, PhD (California)
H. Hund, PhD (Cape Town), Habituation (Freiburg)

Faculty Members of Applied Mathematics holding cross appointments to:
1Chemistry
2Physics
3Mechanical Engineering

Faculty Members holding cross appointments to Applied Mathematics from:
4Computer Science
5Civil Engineering
6Chemistry
7Pure Mathematics

DEPARTMENT OF COMBINATORICS AND OPTIMIZATION

Associate Professor and Chairman of the Department
P.J. Schellenberg, BSc, MA, PhD (Waterloo)

Professor, Associate Dean, Graduate Studies, Faculty of Mathematics
L.B. Richmond, BSc, MSc (Manitoba), PhD (Alberta)

Lecturer, Assistant Dean for External Programs
R.G. Dunkley, BA (Western Ontario)

Associate Professor and Associate Chairman for Graduate Affairs
U.S.R. Murty, BA (Andhra), MA (Osmania), PhD (Indian Inst. Stat.)

Associate Professor and Associate Chairman for Undergraduate Affairs
I.P. Goulden, BMATH, MMATH, PhD (Waterloo), NSERC University Research Fellow
**DEPARTMENT OF COMPUTER SCIENCE**

**Professor and Chairman of the Department**

R.B. Simpson, BSc, MASc (Toronto), PhD (Maryland)

**Professor, Dean of Computing and Communications**

J.W. Graham, BA, MA (Toronto), Recipient of the Distinguished Teacher Award

**Associate Professor, Associate Dean, Undergraduate Studies, Faculty of Mathematics**

V.A. Dyck, BMath, MMath (Waterloo)

**Professor and Associate Chairman for Graduate Studies**

D. Wood, BSc, PhD (Leeds)

**Professor and Associate Chairman for Undergraduate Studies**

J.D. Dyment

**Professors**

R.H. Bartels, BSc, BS (Michigan), PhD (Stanford)

K.S. Booth, BS (California Inst. Tech.), MA, PhD (California-Berkeley)

J.A. Brzozowski, BSc, MSC (Toronto), PhD (Princeton)

A.R. Conn, BSc (Imperial College), MSc (Manitoba), PhD (Waterloo)

D.D. Cowan, BASc, (Toronto), MSc, PhD (Waterloo)

K. Culik, MSC, RNDr (Prague), PhD (Czechoslovak Acad. Sci.)

M.I. Elmasry, BSc, EE (Cairo), MASc, PhD (Ottawa)

J.A. George, BSc, MSC (Alberta), PhD (Stanford) (on leave)

G.H. Gonnet, Cpr U (Uruguay), MMath, PhD (Waterloo)

J.D. Lawson, BASc (Toronto), MSc, PhD (Waterloo), RMA

J.L. Morris, BSc (Leicester), PhD (St. Andrews), FIMA (on leave)

R.C. Mullin, BA (Western Ontario), PhD (Waterloo)

J.I. Munro, BA (New Brunswick), MSC (British Columbia), PhD (Toronto)

W.R. Pulleyblank, BA, MSC (Calgary), PhD (Waterloo)

M.H. van Emden, MEng (Delft), PhD (Amsterdam)

S.A. Vanstone, MMath, PhD (Waterloo)

J.W. Wong, BS, MS, PhD (California-Los Angeles)

**Associate Professors**

J.C. Beatty, BA (Princeton), PhD (California-Berkeley)

F.J. Burkowski, BSc, MMath, PhD (Waterloo)

C.J. Colbourn, BSc (Toronto), MMath (Waterloo), PhD (Toronto)

G.V. Cormack, BSc, MSC, PhD (Manitoba)

J. Dickey, BSc, MA (Arizona), PhD (Wisconsin)

K.O. Geddes, BA (Saskatchewan), MSc, PhD (Toronto)

M.L. Jones, BSc, MSc, PhD (Toronto), Med (Saskatchewan) (on leave)

P.A. Larson, BSc, MBA, PhD (Abo Swedish University)

F. Mavromoustakis, BSc (Tehran), Diploma-Graduate Studies (Netherlands), PhD (Imperial College), DIC

N.S. Ostlund, BA (Saskatchewan), MSc, PhD (Carnegie-Mellon)

D. Rotem, BSc (Hebrew University of Jerusalem), PhD (Waterloo) (on leave)

F.W. Tompa, ScB, ScM (Brown), PhD (Toronto)

**Assistant Professors**

R. Aleliunas, BMath (Waterloo), MSc, PhD (Toronto) (on leave)

J.P. Black, BSc (Calgary), Diplôme d’Ingénieur (Grenoble), PhD (Waterloo)

P.A. Buhr, BSc, MSc, PhD (Manitoba)

J.F. Buss, BS (California Inst. Tech.), PhD (MIT)

B.W. Char, BA (Swarthmore), PhD (California-Berkeley)

S. Christodoulakis, BSc (Greece), MSc (Queens), PhD (Toronto)

R. Cohen, BA (McGill), MSc, PhD (Toronto)

D.E. Field, BS (Maryland), MA, PhD (Princeton) (on leave)

J.H. Johnson, BMath, MMath, PhD (Waterloo)

J. Lipovský, BASc, MASc (Silesia), MSc, PhD (Waterloo)

J.K. Pachl, RNDr (Prague), PhD (Waterloo)

D.L. Poole, BSc (Flinders), PhD (Australian Nat. Univ.)

W.L. Seward, BSc (Victoria), MSc, PhD (Waterloo)

D.J. Taylor, BSc (Saskatchewan), MMath, PhD (Waterloo)

J.H. Vellinga, BA (Western Ontario), MA (Waterloo) (Part-time)
Adjunct Faculty

D.K. Banerji, B.Tech (ITT, India), MSc (Ottawa), PhD (Waterloo)
B.A. Basky, BSc (McGill), MS (Cornell), PhD (Utah)
W.B. Cowan, BSc (Waterloo), PhD (McGill)
P.H. Dinklen, BSc, MA (Waterloo)
W.M. Gentleman, BSc (McGill), MA, PhD (Princeton)
R.G. Goebel, BSc (Regina), MSc (Alberta), PhD (UBC)
J. Majithia, BSc (Univ. London), MEng, PhD (McMaster)
M.A. Malcolm, BSc, MEng (Denver), MS, PhD (Stanford)
E.G. Manning, BSc, MSc (Waterloo), PhD (Pennsylvania)

Faculty Members of Computer Science holding cross appointments to:
1. Applied Mathematics
2. Electrical Engineering
3. Combinatorics and Optimization

Faculty Members holding cross appointments to Computer Science from:
4. Electrical Engineering
5. Combinatorics and Optimization
6. St. Jerome’s College
7. Pure Math

DEPARTMENT OF PURE MATHEMATICS

Professor and Chairman of the Department
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Research Assistant Professor
P.A. Mischenko, BSc, MSc, PhD (Toronto), NSERC University Research Fellow

Adjunct Faculty
H. Haruki, MSc, PhD (Osaka)

Faculty Members of Pure Mathematics holding cross appointments to:
1. Applied Mathematics
2. Philosophy
3. Combinatorics and Optimization
4. Computer Science

DEPARTMENT OF STATISTICS AND ACTUARIAL SCIENCE

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Professor, Dean of the Faculty of Mathematics
J.G. Kalbfleisch, BSc (Toronto), MA, PhD (Waterloo)

Associate Professor, Associate Chairman, Actuarial Science
R.L. Brown, BMath (Waterloo), FSA, FCIA, ACAS

Associate Professor, Associate Chairman, Graduate Studies
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K.R. Shah, BA, MA (Bombay), PhD (Indian Statistical Institute)
D.A. Sprott,2 BA, MA, PhD (Toronto), FRCS, FRPS
M.E. Thompson, BSc (Toronto), MSc, PhD (Illinois)

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G.W. Bennett, BSc, BA, PhD (Adelaide), FSA, FCIA
M.A. Bennett, BA (Nottingham), FSA, FCIA
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W.H. Cherry, BSc, PhD (Melbourne)
D.E. Matthews, BA, MA (Western Ontario), PhD (London), DIC
F.G. Reynolds, BSc, MSc (Manitoba), EA, FSA, FCIA
W.S. Rickert, BSc, PhD (Waterloo)
J.C. Robinson, BSc, MSc, PhD (Waterloo)
J.B. Whitney,4 BA, MA (Western Ontario), PhD (Toronto)
J.C. Young, BASc (Toronto), MSc (Waterloo), PhD (Edinburgh)

Assistant Professors
C.D. Cutler, BSc (Winnipeg), MSc, PhD (Carleton)
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), MATH (Mathematics Elective), PMATH (Pure Mathematics), STAT (Statistics). The course descriptions which follow appear in ascending order by course number within these groups. Unless otherwise indicated with the course description, and provided space is available (see Section 5.3 on page 13:26), these courses are normally open to students in any UW faculty, subject to stated prerequisite requirements (see Section 5.4 on page 13:27).

2. Certain core mathematics courses are offered at three different levels. The Advanced Honours level courses are intended for exceptionally gifted students in an Honours program. A student pursuing an Honours degree may substitute the corresponding Advanced Honours level course(s) for any required Honours level course(s). Similarly, a student pursuing a Pass or General degree may substitute the corresponding Honours level course(s) for any required General level course(s), unless the student has been required by the Standings and Promotions Committee to change from an Honours program to General or Pass. In this case, the student must enrol in General level courses. The following table sets out corresponding Advanced, Honours and General Courses.
### Actuarial Science

#### Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

**ACTSC 221 F,W,S 3C 0.5**  
Mathematics of Investment  
The theory of rates of interest and discount; annuities and sinking funds with practical applications to mortgage and bond questions. Yield rates.  
Prereq: At least second year standing  
Antireq: ACTSC 231  
ACTSC 221 cannot be counted for credit toward a BMath Honours Actuarial Science degree.

**ACTSC 222 F,W 3C 0.5**  
Contingencies  
An introduction to the mathematical basis underlying insurance and other types of financial programs including uncertain future events and discounting.  
Prereq: ACTSC 221 or 231  
Antireq: ACTSC 232  
ACTSC 222 cannot be counted for credit toward a BMath Honours Actuarial Science degree.

**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 forces 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 1306  
Antireq: ACTSC 221

**ACTSC 232 F,S 3C 0.5**  
Introduction to Life Contingencies  
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. Multiple decrement theory.  
Prereq: ACTSC 231, MTHEL 305A, STAT 230  
Antireq: ACTSC 222

**ACTSC 331 F,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 nonforfeiture options.  
Prereq: ACTSC 232
ACTSC 451 F 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 and reserves are investigated.
Coreq: MATH 335, ACTSC 331

ACTSC 453 F,S 3C 0.5
Basic Pension Mathematics
Prereq: ACTSC 332 or consent of instructor

ACTSC 454 W 3C 0.5
Pension Funding
Group and other generalized cost methods for pension plans. Effects of early retirement, plan design and actuarial assumptions on pension costs. Cost forecasts applied to private and public pension plans - in particular to the CPP.
Prereq: ACTSC 453 or consent of instructor

ACTSC 455 W 3C 0.5
Analysis of Financial Statements
Topics in insurance financial reporting including assets, liabilities, surplus, amortization of gains, the Canadian method of actuarial reserves, interest and currency reserves, and the analysis of gains and losses.
Prereq: ACTSC 331 or consent of instructor

ACTSC 463 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 222

COURSES NOT OFFERED 1977-78

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 484 Topics in Casualty Insurance 2

ACTSC 491 Seminar in Actuarial Mathematics 1
ACTSC 492 Seminar in Actuarial Science 2

Course Descriptions

Applications of Mathematics

Difference equations, Laplace transforms applied to discrete and continuous mathematical models taken from ecology, biology, economics and other fields.
Prereq: MATH 2208 or consent of instructor

AM 340 W 3C 0.5

Elementary Differential Geometry and Tensor Analysis

Curves in Euclidean 3-Space (E^3) and the Serret-Frenet formulas; surfaces in 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: MATH 2308 or consent of instructor
Cross-listed as PMATH 365

AM 362 F,S 3C 0.5

Introduction to Continuum Mechanics
Prereq: MATH 2308 and AM 371, or consent of instructor
Coreq: MATH 3328 (or PMATH 382)

AM 371 F,S 3C 0.5

Partial Differential Equations of Applied Mathematics 1
First order partial differential equations and characteristic curves; classification of linear second order partial differential equations; the Cauchy initial value problem; the Dirichlet problem. Solution of the heat equation, wave equation, and Laplace's equation by separation of variables, Fourier series, propagation of waves, the maximum principle for harmonic functions.
Prereq: AM 270 and MATH 2308, or consent of instructor
Course Descriptions

Mathematics: Applied Mathematics

AM 466 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 365

AM 468 F 3C 0.5
Topics in Applied Mathematics
A selection of special topics given by members of the Applied Mathematics Department.
Prereq: Consent of instructor

AM 472 W 3C 0.5
Linear Operators
Linear operators in Hilbert spaces. Compact operators. Introduction to functional analysis.
Prereq: AM 462 or consent of instructor

AM 474 F 3C 0.5
Topics in Differential Geometry
Grassman algebras, differential forms, Lie derivatives, isometries, Killing vector fields, applications to continuum mechanics, differentiable manifolds and applications of differential forms to physics.
Prereq: AM 362/PMATH 365 or consent of instructor

Consent of instructor

AM 381 F.S. 3C 0.5
Ordinary Differential Equations 2
Prereq: AM 381

AM 456A F 3C 0.5
Quantum Mechanics 2
Prereq: AM 465A
AM 451A F 3C 0.5
Partial Differential Equations of Applied Mathematics 2
Elliptic equations: uniqueness theorems, Green's functions and boundary value problems, potential theory, applications to electrodynamics and fluid mechanics, finite differences. Hyperbolic equations: Cauchy's problem, characteristics, Riemann's methods, wave equation, applications to electrodynamics and fluid mechanics, finite differences.
Prereq: AM 371, 381 and 391, or consent of instructor
Antireq: MATH 215, MATH 276

AM 451B W 3C 0.5
Partial Differential Equations of Applied Mathematics 3
Parabolic equations: uniqueness theorems, Green's functions and boundary value problems, finite differences. Additional selected topics may include: Cauchy-Kowalewski Theorem, Hamilton-Jacobi Theory, maximum principles, formulation of well-posed problems, hyperbolic systems.
Prereq: AM 481A

AM 482 F 3C 0.5
Calculus of Variations
Prereq: MATH 230 or consent of instructor

AM 486 F 3C 0.5
Electromagnetism
Applications of Maxwell's equations. Introduction to wave guides and antennae.
Prereq: PHYS 253 or consent of instructor

AM 488 W 3C 0.5
Control Theory
Prereq: Consent of instructor

AM 489 F 0.5
Reading Course

AM 495 W 3C 0.5
Elasticity
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 Venants' principle.
Prereq: AM 385

AM 499 W 0.5
Reading Course

COURSES NOT OFFERED 1987-88
AM 364 Special Relativity
AM 430 Applications of Mathematics
AM 440 Applications of Mathematics
AM 461 Non-Linear Differential Equations
AM 463 Introduction to Differentiable Manifolds

C&O 230 F,W,S 3C 0.5
Introduction to Combinatorics
Introduction to the combinatorics of ordinary generating functions. Introduction to basic graph theory and graphical algorithms. 
Prereq: MATH 1306, 1348
Antireq: C&O 290
Also offered at St. Jerome's College in Fall Term.

C&O 270 F,W,S 3C 0.5
Introduction to Optimization
Prereq: MATH 1306, 1348
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 ordinary and exponential generating functions. Matrix methods, and decompositions. The Lagrange theorem. Applications to enumeration of sequences, trees, covers, lattice paths and partitions.
Prereq: C&O 230
C&O 331 F,S 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. Prereq: MATH 224B
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. Prereq: C&O 290, MATH 224A

C&O 343 W 3C 0.5 Graph Theory 2

C&O 350 F,W,S 3C 0.5 Linear Programming
A first course in problem formulation and solution techniques in linear programming. The simplex and revised simplex methods. Active set formulation of the simplex method. Theory and applications of duality theory. Sensitivity Analysis. Prereq: MATH 224A

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 Problem, Pick's Theorem, partitioning the interior of a rectangle into squares of different sizes, an introduction to the theory of convex sets in the plane. Heil's theorem and certain ramifications will be explored. Prereq: MATH 130B, 134A/B. (MATH 220B, 224B are recommended.) 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 370 F,W 3C 0.5 Deterministic OR Models
An applications-oriented course that illustrates how various mathematical models and methods of optimization can be used to solve problems arising in business, industry and science. Prereq: C&O 350
Antireq: ACTSC 335

C&O 380 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. Prereq: MATH 130B, 134A/B. (MATH 220B, 224B are recommended.) 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 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: MATH 234B and STAT 230, or permission of instructor

C&O 438 F 3C 0.5 Combinatorial Computing
A course covering a number of applications of computers to combinatorial problems. General procedures - backtrack 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
C&O 452 W 2C 0.5
Integer Programming
A study of several techniques for solving integer (linear) programming problems. Cutting planes, implicit enumeration, branch-and-bound. Introduction to Boolean and pseudo-Boolean programming. Applications to problems of optimum routing, site location, set covering and packing, logic and lattice theory.
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 F 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, CS 375, C&O 350, or CS 337, and consent of instructor. CS 374 is recommended. Cross-listed as CS 473

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 from 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
Topics include: famous construction problems, Mascheroni’s theorem, amicable pairs, perfect numbers and related numbers; Pythagorean triples; some of Archimedes’ great accomplishments: squaring the parabola; estimation of pi; Archimedes’ “Method”, the volume of the sphere; inscribed regular polygons.
Prereq: MATH 130B, 134A/B. (MATH 220B, 224B are recommended.)
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 481 W,S 2C 0.5
History of Mathematics 2
A continuation of C&O 480 (History of Mathematics 1), but may also be taken independently. Topics include: the Fibonacci sequence; prime numbers; Fermat’s last theorem; Gaussian integers; Euler’s formula and regular solids; famous problems in geometry.
Prereq: MATH 130B, 134A/B. (MATH 220B, 224B are recommended.)
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 489 F,W,S 2R 0.5
Reading in Combinatorics and Optimization
Prereq: Consent of department

Computer Science
Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

Introductory Notes
1. The Department of Computer Science has two distinct streams of courses, one exclusively for students who have been admitted to 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 Computer Science with Electrical Engineering Electives, Honours Co-op Computer Science-Information Systems Option, Honours Computer Science/Business Administration, Honours Computer Science/Chartered Accountancy, Honours Computer Science/Management Accounting, and all Joint and Double Honours BMath programs involving Computer Science as one of the majors.

The non-specialists’ courses 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. These courses are numbered with a middle digit of 0 through 3.
When resources permit, students with exceptionally high academic standing in other programs may be considered for admission to CS Major courses on an individual basis. To be considered, students should first obtain a written recommendation from their Faculty Advisor and then consult a Computer Science Advisor.

2. The Computer Science Department is experiencing tremendous 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 these 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 5.3 on page 13:26.) 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.) For courses that are over-subscribed, however, priority for registration will normally be given to students registered full-time in a degree program.

4. Limits on the number of CS courses students may take concurrently will be published at preregistration time. Normally, all students in first and second year may preregister for at most one CS course per term, and students other than Computer Science Majors may preregister for at most two CS courses per term in third and fourth year.

5. Computer Science courses may not normally comprise more than one-third of a student’s total credits accumulated at the University of Waterloo.

6. 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.

7. More detailed course descriptions and course outlines are available upon request from the Computer Science Department. Students in faculties other than Mathematics should take particular note of the following courses: CS 100, 102, 234, 235, 316.

8. For the purposes of prerequisites, the following courses are normally considered to be equivalent: (CS 234 and 240), (CS 236 and 250), (CS 334 and 340), and (CS 335 and 360/354).

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 330, 432, 438, 446, 448 and 452.

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.

CS 100 cannot be counted for credit toward a BMath degree.

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 high school computing)

CS 102 cannot be counted for credit toward a BMath degree.

CS 140 F.W.S 3C,2L 0.5
Introduction to Mathematical Problem Solving by Computer
An introduction to the analysis of mathematical problems, development of mathematical models and algorithms for their solution; implementation in a procedure-oriented language (normally FORTRAN). Topics discussed are: solution of equations, computation of integrals, graph plotting, and simulation.

Prereq: Full-time degree registration in the Faculty of Mathematics

Special sections of this course will use PASCAL rather than FORTRAN/77.

Also offered at St. Jerome’s College in the Winter term.

CS 180 F.W. 2C,2L 0.5
Introduction to File Processing
Introduction to the use of computers. Concept of an algorithm. Language and notation for describing algorithms. Analysis and solution of problems dealing with files. Introduction to a procedure-oriented language (usually COBOL). The preparation and debugging of programs in such a language. Topics include: file processing and maintenance, sorting, report generation, and file design.

Prereq: Full-time degree registration in the Faculty of Mathematics

Also offered at St. Jerome’s College in the Winter term.

CS 234 F.W.S 2C,2T 0.5
Programming Principles and Practice
To develop a sophisticated user-oriented understanding of software. A disciplined approach to program design. The need for and use of various control structures and data structures. Features of several high-level languages; techniques for their effective use. Specific topics include: structured programming, linked-list processing, recursion, string processing, tree processing and language development.

Prereq: One of CS 102, 140, 180, or equivalent

Antireq: CS 240

CS 235 F.W.S 2C,1T 0.5
Introduction to Computers and Computer Systems
To give a basic understanding of what goes on inside a computer, of machine organization, and of machine and assembly-language programming. To introduce students to computer software designed to assist user programs. To make students better users of a computer. Specific topics include: simple machine architecture, assembler-level programming, addressing modes and operating system services.

Prereq: One of CS 102, 140, 180, or equivalent

Antireq: CS 117, 250
CS 240 F.W.S 2C.2T 0.5
Programming Principles, Languages, and Techniques
To develop a thorough understanding of software as needed for program design. The need for and use of various control structures and data structures. Features of several high level languages, techniques for their effective use. Specific topics include structured programming, linked-list processing, recursion, string processing, tree processing and language development.
Prereq: CS 250 and second-year standing in a Computer Science Major program
Antireq: CS 234

CS 250 F.W 3C.1T 0.5
Fundamentals of Computers and Computer Systems
To give a thorough introduction to what goes on inside a computer, of machine organization, and of machine and assembly-language programming. To introduce students to computer software designed to assist user programs. Specific topics include: addressing modes, subroutines and macros, microcomputer architecture, and operating system components.
Prereq: CS 140 and second-year standing in a Computer Science Major program
Antireq: CS 117, 225

CS 316 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 316 cannot be counted for credit toward a BMath degree.
Cross-listed as REC 372

CS 320 F.W.S 3C 0.5
Introduction to Business 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 a selection of commercially available software systems.
Prereq: One of CS 102, 140, 180, or equivalent, and a knowledge of accounting (e.g. ACC 101 or ACC 121/122)
CS 320 cannot be counted for credit toward a BMath Honours Computer Science degree.

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: CS 234 and third-year standing
Antireq: CS 340
CS 334 cannot be counted for credit toward a BMath Honours Computer Science degree.

CS 335 W 3C 0.5
Computing Systems
A study of those hardware and software components comprising a computing system, with an emphasis on the role of operating systems in the support of programming activities. Topics include: computer architecture; input/output; operating systems; linkers, loaders, and libraries.
Prereq: CS 234, 235 and third-year standing
Antireq: CS 350
CS 335 cannot be counted for credit toward a BMath Honours Computer Science degree.

CS 356 F.W.S 3C 0.5
Digital Networks
Prereq: CS 260 or EL E 222, and third-year standing in a Computer Science Major program
Antireq: CS 334
CS 390 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 algorithm optimality.
Prereq: CS 240, MATH 234B and third-year standing in a Computer Science Major program.

CS 372 F,W 3C 0.5
Introduction to Scientific Computation: Numerical Linear Algebra
Pitfalls in computation. Direct solution of linear algebraic systems. Iterative solution of linear systems. Least-squares approximations. Iterative solution of f(x) = 0. Minimization of functions of several variables.
Prereq: CS 140, MATH 230B, 234A
Antireq: CS 337, 375

CS 374 F,W 3C 0.5
Introduction to Scientific Computation: Numerical Approximation
Prereq: CS 140, MATH 234A/B
Antireq: CS 337, 375

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 234 and a CS half-credit labeled CS 330 or higher, and third-year standing
CS 336 is a recommended pre/corequisite.
CS 430 cannot be counted for credit toward a BMath Honours Computer Science degree.

CS 432 F,S 3C 0.5
Business Systems Analysis
Prereq: CS 334 or 438, and third-year standing
Antireq: CS 434, 482
CS 432 cannot be counted for credit toward a BMath Honours Computer Science degree.

CS 435 W 3C 0.5
Topics in Computing Systems
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; queuing theory fundamentals; 2-D graphics; advanced software and hardware architectures; computer selection.
Prereq: CS 335 and third-year standing
CS 435 cannot be counted for credit toward a BMath Honours Computer Science degree.

CS 437 W 3C 0.5
Simulation by Computer
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: CS 334 or 438, STAT 220, and third-year standing
Antireq: CS 457
CS 437 cannot be counted for credit toward a BMath Honours Computer Science degree.

CS 436 F,W,S 3C 0.5
Computer Applications in Business: Data Bases
A user-oriented approach to the management of large collections of data. Methods used for the storage, selection and presentation of data. Common data base management systems.
Prereq: CS 234 or 330, and third-year standing
Antireq: CS 448
CS 436 cannot be counted for credit toward a BMath Honours Computer Science Degree.

CS 442 W 3C 0.5
Comparative Programming Languages
This course is designed to give students a critical understanding of programming language concepts and to provide them with an appreciation for the implications of various language design decisions. Students also learn some fundamentals about language processors.
Prereq: CS 340, 390 and fourth-year standing in a Computer Science Major program.

CS 443 F,S 3C 0.5
Functional and Logic Programming
Introduction to the concepts of functional programming and logic, including programming by specification, programming without side effects and the use of non-standard control structures. Fundamentals of logic, calculus, model theoretic semantics and proof procedures. Exposure to languages like PROLOG, LISP, HOPE, FP and NIAL.
Prereq: CS 340 and fourth-year standing in a Computer Science Major program.

CS 444 W 3C 0.5
Compiler Construction
Prereq: CS 340, 350, 360 and fourth-year standing in a Computer Science Major program.

CS 446 F,W,S 3C 0.5
Software System Design and Implementation
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 240 and fourth-year standing in a Computer Science Major program.
CS 354 is a recommended prereq site.
CS 448 F,W,S 3C 0.5  
Introduction to Database Management  
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 438

CS 450 F,S 3C 0.5  
Computer Architecture  
The course is intended to prepare the student to choose a suitable computer for a given application. Review of combinational and sequential logic circuits. Discussion of "building block" - central processing units, stores, input/output systems, and bus structures. Case studies of machines.  
Prereq: CS 360, one of CS 356, CS 369, EL E 323, and fourth-year standing in a Computer Science Major program

CS 452 F,W,S 3C 0.5  
Real-time Programming  
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 350, 354 and fourth-year standing in a Computer Science Major program

CS 454 F,S 3C 0.5  
Distributed Systems  
A basic introduction to modern, loosely-coupled distributed systems, including fairly comprehensive presentation of one or more example systems, discussions of software and hardware architecture, and theoretical treatment of some fundamental algorithms.  
Prereq: CS 354 and fourth-year standing in a Computer Science Major program. CS 350 and CS 456 are recommended

CS 456 W 3C 0.5  
Data Communications  
This course is intended to introduce the student to the basic concepts of data communications, the computer-communication interface, and new telecommunications services. Topics include: basic queuing theory, data communications and the telephone network, computer architecture for data communications, protocols, error handling, multiplexing and switching, and packet switching networks.  
Prereq: CS 364, STAT 230 and fourth-year standing in a Computer Science Major program  
CS 457 is a recommended corequisite.

CS 457 W 3C 0.5  
Queueing Models: Analysis, Simulation, and Computer Applications  
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, 360 and fourth-year standing in a Computer Science Major program  
Antireq: CS 437

CS 458 F,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 358 or 369, CS 350 and fourth-year standing in a Computer Science Major program

CS 462 F 3C 0.5  
Formal Languages and Parsing  
Prereq: CS 360 and fourth-year standing

CS 464 W 3C 0.5  
Computability and Recursive Function Theory  
Models of the computational process as reflected by computers, linguistic systems, functional specifications, transformational systems, formal logic, etc. Equivalence of these models. Computational complexity for specific models and abstractions.  
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 problem.  
Prereq: CS 340 and fourth-year standing  
CS 360 is recommended

CS 468 W 3C 0.5  
Program Verification  
Methods of program verification. Implications for structured programming. Inductive reasoning about recursive programs and recursively defined data structures.  
Prereq: CS 360 and fourth-year standing

CS 472 W 3C 0.5  
Numerical Linear Algebra  
Prereq: CS 372 or 375, or CS 337 and consent of instructor. CS 374 is recommended

CS 473 F 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, CS 375, C&O 350, or CS 337, and consent of instructor. CS 374 is recommended  
Cross-listed as C&O 458
Numerical Approximation
Prereq: CS 374 or 375, or CS 337 and MATH 3328 and consent of instructor. CS 372 is recommended.

Numerical Solution of Differential and Integral Equations
Initial value problems; existence and uniqueness of solutions, one step methods, multistep methods, stability, error analysis. Boundary value problems; shooting and discretization methods, implementation problems especially for non-linear equations. Integral equations; correspondence to ordinary differential equations, initial value and boundary value problems, solution techniques.
Prereq: CS 374, or CS 337 and consent of instructor. CS 372 is recommended.

Numerical Solution of Partial Differential Equations
Prereq: CS 374, or CS 337 and consent of instructor. CS 372 is recommended.

Techniques in Systems Analysis
Technique 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
Antireq: CS 432, 434

Introduction to Artificial Intelligence
Prereq: CS 240 and fourth-year standing in a Computer Science Major program

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, PMATH 334 (or consent of instructor), and fourth-year standing.

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, colour shading techniques, and some additional topics will be covered.
Prereq: CS 340, 350, MATH 234A and, fourth-year standing in a Computer Science Major program

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

Advanced Topics in Computer Science
See the Course Offerings List for topics available.
Prereq: Fourth-year standing in a Computer Science Major program

Readings in Computer Science
This course cannot be used to satisfy any 400-level course requirement in a Computer Science Major program.

CS 374 3C 0.5
CS 476 F,W,S 3C 0.5
CS 486 F,W,S 3C 0.5
CS 487 W 3C 0.5
CS 488 F,W,S 3C 0.5
CS 489 0.5

Mathematics

Course Descriptions

Mathematics

Courses not offered in the current academic year are listed at the end of this section.

Introductory Note
Students in faculties other than Engineering should consult their faculty advisor regarding how term courses with 0.625 credit weight are counted for degree credit purposes.

MATH 100 F,W,S 1C 0.0
Co-op Orientation
MATH 100 is a non-credit orientation course for new Co-op Math students.

MATH 101 F,W,S 0.0
Non-Credit Night Lab
All students enrolled in MATH 130A/B, MATH 134A/B, and/or CS 140/180 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 103 F 3C,1T 0.5
Introductory Algebra (For students in Arts/Social Sciences)
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 the equivalent
Not open to students in the Faculty of Mathematics or to students who have credit in Grade 13 Algebra.
Students who have credit in both Grade 13 Calculus and Relations and Functions must obtain permission from the instructor to take MATH 103.
MATH 104 W 3C,1T 0.5
Introductory Calculus (For students in Arts/Social Sciences)
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 the equivalent.
Not open to students in the Faculty of Mathematics or to students who have credit in Grade 13 Calculus.

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. Not open to students in the Faculty of Mathematics.
Antireq: MATH 110A, 113A, 115A, 130A, 140A

MATH 110A F 3C,2T 0.625
Calculus 1a (For Engineering Students)
Functions, continuity and derivatives; Trig functions, Related rates, Curve sketching. Exponential and log functions. Integration, Techniques of Integration. Applications to area and volume problems. Prereq: Grade 13 Calculus
Not open to students in the Faculty of Mathematics.
Antireq: MATH 106, 113A, 115A, 130A, 140A

MATH 110B W,S 3C,2T 0.6
Calculus 1b (For Engineering Students)
Not open to students in the Faculty of Mathematics.
Antireq: MATH 113B, 115B, 130B, 140B

MATH 111A F 3C,1T 0.5
Algebra (For Arts and Science Students)
Elementary Number Theory, number systems, mathematical induction, the Binomial Theorem, complex numbers, polynomials.
Prereq: Grade 13 Algebra is recommended but not required
Not open to students in the Faculty of Mathematics.
Antireq: MATH 134A, 144A

MATH 111B W,S 3C,1T 0.5
Linear Algebra and Solid Geometry (For Arts and Science Students)
Determinants, vectors, matrices, elementary solid geometry, systems of linear equations.
Prereq: Grade 13 Algebra is recommended but not required
Not open to students in the Faculty of Mathematics.
Antireq: MATH 114, 134B, 144B

MATH 113A F 3C,2T 0.5
Calculus (For Arts and Science Students)
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 Calculus
Not open to students in the Faculty of Mathematics.
Antireq: MATH 106, 110A, 115A, 130A, 140A

MATH 113B W 3C,2T 0.5
Calculus (For Arts and Science Students)
Prereq: MATH 113A
Not open to students in the Faculty of Mathematics.
Antireq: MATH 110B, 113B, 130B, 140B

MATH 115A F 3C,2T 0.5
Calculus (For Co-op Physics and Chemistry)
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 Calculus
Not open to students in the Faculty of Mathematics.
Antireq: MATH 106, 110A, 113A, 130A, 140A

MATH 115B W,S 3C,2T 0.5
Calculus (For Co-op Physics and Chemistry)
Prereq: MATH 115A
Not open to students in the Faculty of Mathematics.
Antireq: MATH 110B, 113B, 130B, 140B

MATH 134A F,W,S 3C,1T 0.5
Calculus
Functions and limits, differentiation of trigonometric, logarithmic and exponential functions, the chain rule, Rolle's theorem, the mean value theorem, extreme value theorem, applications of the derivative, the definite, the definite integral, fundamental theorem of calculus.
Prereq: Grade 13 Calculus
Also offered at St. Jerome's College in the Fall term.

MATH 134B F,W,S 3C,1T 0.5
Calculus
Techniques of integration, applications of the integral, indeterminate forms, Taylor's theorem, convergence of sequences and series, power series.
Prereq: MATH 130A
Antireq: MATH 110B, 113B, 130B, 140B
Also offered at St. Jerome's College in the Winter term.

MATH 134C F,W 3C,1T 0.5
Algebra
Basic set theory, cardinality, elementary number theory, number systems, polynomials.
Prereq: Grade 13 Algebra
Antireq: MATH 111A, 144A
Also offered at St. Jerome's College in the Fall term.
MATH 134R F,W,S 3C,1T 0.5
Linear Algebra 1
Systems of equations, vector spaces, matrices, determinants, geometric applications.
Prereq: Grade 13 Algebra (MATH 134A is recommended, but not required)
Antireq: MATH 111B, 114, 144B
Also offered at St. Jerome's College in the Winter term.

MATH 140A F 3C 0.5
Calculus
MATH 140A is an advanced-level, enriched version of MATH 130A.
Prereq: Grade 13 Calculus and a Grade 13 Math. Average of at least 85%
(or permission of instructor)
Antireq: MATH 110A, 113A, 115A, 130A

MATH 140B W,S 3C 0.5
Calculus
MATH 140B is an advanced-level, enriched version of MATH 130B.
Prereq: MATH 140A (or permission of instructor)
Antireq: MATH 110B, 113B, 115B, 130B

MATH 144A F 3C 0.5
Algebra
MATH 144A is an advanced-level, enriched version of MATH 134A,
Prereq: Grade 13 Algebra and a Grade 13 Math. Average of at least 85%
(or permission of instructor)
Antireq: MATH 111A, 134A

MATH 144B W,S 3C 0.5
Linear Algebra 1
MATH 144B is an advanced-level, enriched version of MATH 134B.
Prereq: MATH 144A (or permission of instructor)
Antireq: MATH 111B, 114, 134B

MATH 210 F,W 3C 0.5
Calculus 2 (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 110B
Not open to students in the Faculty of Mathematics.

MATH 211 F,W 3C,1T 0.5
Advanced Calculus for Electrical Engineers 1
Fourier series; Ordinary differential equations; Laplace transform; applications to
linear electrical systems.
Prereq: MATH 110B
Not open to students in the Faculty of Mathematics.
Cross-listed as EL E 205
Antireq: MATH 213A, 220A, 230A, 240A

MATH 212 F,S 3C,1T 0.5
Advanced Calculus for Electrical Engineers 2
Vector differential calculus. Multiple Integrals. Line and Surface integrals.
Complex analysis: analytic functions, complex integrals, residues. Partial differential
equations.
Prereq: MATH 211
Not open to students in the Faculty of Mathematics.
Cross-listed as EL E 206
Antireq: MATH 210, 213B, 220B, 230B, 240A

MATH 213A F 3C 0.5
Calculus 2 (For Science Students)
Infinite series. Partial derivatives, chain rule, total differential, Taylor's theorem,
extreme values.
Prereq: MATH 113B or 115B, and MATH 111B, or equivalent
Not open to students in the Faculty of Mathematics.
Antireq: MATH 211, 220A, 230A, 240A

MATH 213B W,S 3C 0.5
Calculus 2 (For Science Students)
Multiple Integrals. Vector calculus: gradient, directional derivative, divergence,
curl, line integrals and path independence, Green's theorem, Stokes' theorem, and Gauss' theorem.
Prereq: MATH 213A or 220A, or equivalent
Not open to students in the Faculty of Mathematics.
Antireq: MATH 210, 212, 213B, 220B, 240B

MATH 215 F,W 3C 0.5
Differential Equations (For Chemistry Students)
Complex numbers. Partial differentiation. Solution of ordinary differential equations
with emphasis on special functions encountered in chemistry (Hermite and
Legendre equations). Introduction to matrix algebra and eigenvalue problems.
Prereq: MATH 113B or 115B, or equivalent
Not open to students in the Faculty of Mathematics.
Antireq: AM 260, MATH 216
MATH 230A F,W,S 3C,1T 0.5
Advanced Calculus
Differential calculus of functions of several variables; limits and continuity, partial derivatives, differentiability, chain rule, Taylor’s formula, extreme values, mappings and Jacobians. Integral calculus of functions of several variables; multiple integrals, iterated integrals, change of variables, applications to area and volume calculations.
Prereq: MATH 130B
Coreq: MATH 134B
Antireq: MATH 211, 213A, 220A, 240A
Also offered at St. Jerome’s College in the Fall term.

MATH 230B F,W,S 3C,1T 0.5
Advanced Calculus
Line integrals, Green’s theorem and path independence. Sequences and series of functions; uniform convergence and power series. Introduction to ordinary differential equations; first and second order linear equations, power series solutions, applications.
Prereq: MATH 230A
Antireq: MATH 210, 212, 213B, 220B, 240B
Also offered at St. Jerome’s College in the Winter term.

MATH 234A F,W,S 3C 0.5
Linear Algebra 2
Linear transformations, eigenvalues, characteristic polynomials, inner products.
Prereq: MATH 134B
Antireq: MATH 224A, 244A
Also offered at St. Jerome’s College in the Fall term.

MATH 234B F,W,S 3C 0.5
Abstract Algebra 1
Groups, fields and other topics in abstract algebra.
Prereq: MATH 134A, 234A
Antireq: MATH 224B, 244B
Also offered at St. Jerome’s College in the Winter term.

MATH 226A F,W 2C 0.5
Elementary Differential Equations I
Prereq: MATH 144AB (or permission of instructor)
Antireq: MATH 234B, 244B

MATH 226B Elementary Differential Equations II

MATH 101 F 3C 0.5
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 electives.

MTHEL 101 F,W 3C 0.5
Commercial and Business Law for Mathematics Students

MTHEL 102 W,S 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 practices 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.
This course is normally open only to students in the Co-op Math/Teaching Option.
Prereq: Consent of instructor.

COURSES NOT OFFERED 1987-88
MATH 226A Elementary Differential Equations I
MATH 226B Elementary Differential Equations II

Mathematics Electives

Course Descriptions
Courses not offered in the current academic year are listed at the end of this section.

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 electives.

MTHEL 101 F 3C 0.5
Commercial and Business Law for Mathematics Students

MTHEL 102 W,S 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 practices 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.
This course is normally open only to students in the Co-op Math/Teaching Option.
Prereq: Consent of instructor.
Types of Life Insurance contracts and their uses, basis of risk measurements, modified valuation methods, non-forfeiture values, dividend formulas, selection of risks, substantial risks, and principles of reinsurance.

MTHEL 305A F,W 3C 0.5
General Life Insurance 1
Introductory

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.

PMATH 230A 2C,1T 0.5
Introduction to Pure Mathematics
Idea and examples in geometry, number theory, algebra, and analysis. Modern theories are motivated by consideration of historically important topics such as angle trisection, solution by radicals, the real number system, non-Euclidean geometry, and computability of functions.
Prereq: None
Not offered every year

PMATH 230B 2C,1T 0.5
Introduction to Pure Mathematics
Similar to, but independent of, PMATH 230A.
Prereq: None
Not offered every year

PMATH 331 F,W 3C 0.5
Real Variables
Topology of $\mathbb{R}^n$, continuity, norms, metrics, completeness, Fourier series, and applications, for example, to O.D.E.'s, the heat problem, optimal approximation, the isoperimetric inequality.
Prereq: MATH 230B
For students in programs outside of Pure Mathematics.

PMATH 334 F,W,S 3C 0.5
Abstract Algebra 2
Rings, ideals, factor rings, homomorphisms, finite and infinite fields, polynomial roots, field extensions, algebraic numbers, and applications, for example, to Latin squares, finite geometries, geometrical constructions, error-correcting codes.
Prereq: MATH 234B
For students in programs outside of Pure Mathematics.

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
Will be of interest to all math students.

PMATH 344 F,S 3C 0.5
Abstract Algebra
Groups, rings, fields, and applications.
Prereq: MATH 234B
PMATH 344 may be substituted for PMATH 334 whenever this is a requirement in an Honours program.

PMATH 351A F,S 3C 0.5
Real Analysis 1
Metric spaces, compactness, completeness, continuity, convergence, integration, function spaces.
Prereq: MATH 230B
PMATH 351A may be substituted for 331 whenever this is a requirement in an Honours program.

PMATH 351B W 3C 0.5
Real Analysis II
Applications of PMATH 351A concepts to Fourier series, differential equations and other topics.
Prereq: PMATH 351A

PMATH 362 F,S 3C 0.5
Complex Analysis
Analytic functions, Cauchy's theorem, Laurent series, the residue theorem, integral evaluation, Mobius and other conformal maps.
Prereq: MATH 230B
PMATH 362 may be substituted for MATH 322B whenever this is a requirement in an Honours program.

PMATH 365 S 3C 0.5
Differential Geometry and Tensor Analysis
Curves in Euclidean $n$-space ($E^n$) and the Serret-Frenet formulas; 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, Riemann and Einstein tensors. Applications of tensors in Relativity and Continuum Mechanics.
Prereq: MATH 230B or consent of instructor
Cross-listed as AM 362

PMATH 367 W 3C 0.5
Set Theory and General Topology
Intuitive set theory, metric spaces, point set topology.
Prereq: MATH 230A

PMATH 380A 3C 0.5
Introduction to Information Theory with Applications
Prereq: Consent of instructor
Cross-listed as AM 380A
PMATH 380R 3C 0.5
Information Theory with Applications
Prereq: Consent of instructor
Cross-listed as AM 380B

PMATH 399
Readings in Pure Mathematics

PMATH 430A F,W,S 2C,1T 0.5
Introduction to Mathematical Logic
A broad introduction to Mathematical Logic. The logic of sentences: truth-functions and axiomatic approaches (e.g. Natural Deduction and Gentzen sequences). A brief introduction to the logic of predicates and to the foundations of mathematics.

PMATH 430B W 2C,1T 0.5
Introduction to Mathematical Logic
Continuation of PMATH 430A. Gödel's incompleteness theorem (outline). Logicism, intuitionism, formalism. Selected topics (some of intuitionistic logic, modal logic, the representation theorem for Boolean Algebras normally are treated).
Prereq: PMATH 430A.
Will be of interest to all math students.
Antreq: PMATH 432A

PMATH 432A F 3C 0.5
Mathematical Logic
First order languages and theories.
Antreq: PMATH 430A
PMATH 432A is more specialized and presented at a more advanced level than PMATH 430A.

PMATH 432B F 3C 0.5
Mathematical Logic
Continuation of PMATH 432A. A treatment of at least one of the following: set theory, model theory, undecidability.
Prereq: PMATH 432A
Antreq: PMATH 430B
Next offered in Fall 1989, and each alternate Fall thereafter.

PMATH 440 W 2C 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: PMATH 332 or PMATH 352
Antireq: PMATH 430
Next offered in Winter 1988, and each alternate Winter thereafter.

PMATH 441 W 2C 0.5
Algebraic Number Theory
An introduction to algebraic number theory; unique factorization, Dedekind domains, class numbers, Dirichlet's unit theorem, solutions of Diophantine equations, Fermat's 'last theorem'.
Prereq: PMATH 334 or 344
Next offered in Winter 1989, and each alternate Winter thereafter.

PMATH 443 2C 0.5
Linear Algebra 2
Continuation of linear algebra. Main topics: representations of endomorphisms, structure of bilinear forms, multilinear products.
Prereq: PMATH 234A
Not offered every year.

PMATH 445 F 2C 0.5
Ring Theory
Continuation of the theory of rings and modules.
Prereq: PMATH 334 or 344
Next offered in Fall 1988

PMATH 446 W 2C 0.5
Group Theory
Permutations, Cayley Theorem, Sylvow Theorem, Jordan-Hölder Theorem, nilpotent and solvable groups, direct and semidirect products, free groups.
Prereq: PMATH 334 or 344

PMATH 447 F 2C 0.5
Field Theory
Field extensions and Galois theory.
Prereq: PMATH 334 or 344

PMATH 451 F 3C 0.5
Measure and Integration
Lebesgue measure and integral for the real line, general measure and integration theory, convergence theorems, Radon-Nikodym theorem, L^p spaces.
Prereq: PMATH 331 or 381A, or consent of instructor.

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 351 or consent of instructor

PMATH 465 F 3C 0.5
Topics in Differential Geometry
Grassman algebras, differential forms, Lie derivatives, isometries, Killing vector fields, applications to continuum mechanics, differentiable manifolds and applications of differential forms to physics.
Prereq: AM 362/PMATH 365 or consent of instructor
Cross-listed as AM 474

PMATH 467 3C 0.5
Topology
Topics from algebraic, combinatorial and geometric topology.
Prereq: MATH 234B, PMATH 367

PMATH 470A 2C 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

COURSES NOT OFFERED 1997-88
PMATH 461 Finite Geometries
PMATH 463 Differentiable Manifolds
PMATH 470B Functional Equations
Course Descriptions

Statistics

Introduction to Experimental Design
The planning of surveys; simple random sampling, stratified sampling; ratio and difference estimators; cluster and systematic sampling.
Pre requisite: STAT 221
Also offered at St. Jerome's College in the Fall term.

STAT 231 F, W, S 3C, 1T 0.5
Statistics
Estimation, tests of significance, probability plots, contingency tables, normal distribution theory, simple linear regression.
Pre requisite: MATH 220A, STAT 230
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 220.
Pre requisite: MATH 130B

STAT 241 W, S 3C 0.5
Statistics
STAT 241 is an advanced-level enriched version of STAT 231.
Pre requisite: MATH 220A, STAT 230

STAT 304 W 2C, 1L 0.5
Statistics for the Physical Sciences 2
Linear regression. Introduction to the design of experiments. Completely randomized and randomized block designs. Analysis of variance.
Pre requisite: STAT 220 or 204
For Science students only.

STAT 311 F 3C 0.5
Regression and Sampling Methods for Accounting
Review of tests of significance, confidence intervals, and properties of the normal distribution. Normal linear models. Elementary sampling theory.
Pre requisite: A one-term course in statistics or probability
Open only to students in Honours Arts Accounting Programs.

STAT 321 F 3C 0.5
Applied Regression Analysis
Pre requisite: STAT 221
Not open to Honours Mathematics students.
Pre requisite: STAT 331

STAT 332 F 3C 0.5
Application of Sampling Surveys
The planning of surveys; simple random sampling, stratified sampling; ratio and difference estimators; cluster and systematic sampling.
Pre requisite: STAT 221
Not open to Honours Mathematics students.
Pre requisite: STAT 332

STAT 333 F, W, S 3C 0.5
Applied Probability
Pre requisite: STAT 230

STAT 335 W 3C 0.5
Statistical Process Control
Pre requisite: One of STAT 231, M SCI 251, ME 202, SY DE 214, or consent of the instructor

STAT 371 W 3C 0.5
Stochastic OR Models
An introduction to the use of probabilistic models in op. research. Techniques and applications of queueing theory, inventory theory and reliability theory.
Pre requisite: STAT 333
STAT 490 F, S 3C 0.5
Experimental Design
Introduction to designed experiments. Basic experimental designs. Factorial arrangement of treatments. Confounding and fractional replication. Selected topics.
Prereq: STAT 331 or consent of instructor

STAT 431 W 3C 0.5
Applications of Regression Models
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

STAT 433 F 3C 0.5
Stochastic Processes
Point processes. Renewal theory. Stationary processes. Selected topics.
Prereq: STAT 333 or consent of instructor

STAT 440 F 3C 0.5
Statistical Computing
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

STAT 443 W 3C 0.5
Forecasting
Prereq: STAT 331 or consent of instructor

STAT 444 W 3C 0.5
An Introduction to Econometrics
Description and analysis of econometric models such as autoregressive models, lag models, models with errors in variables, simultaneous equations models.
Prereq: STAT 331

STAT 450 W 3C 0.5
Estimation and Hypothesis Testing
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

STAT 464 0.5
Topics in Probability Theory
Prereq: STAT 333 or consent of instructor
May not be offered 1987-88.

STAT 466 0.5
Topics in Statistics I
Prereq: STAT 330, 331 or consent of instructor
May not be offered 1987-88.

COURSES NOT OFFERED 1987-88

STAT 454 Sampling Theory and Practice
STAT 467 Topics in Statistics 2
STAT 468 Readings in Statistics 2

Department of Mechanical Engineering

Professor, Chairman of the Department
H.W. Kerr, BASc, MASC, PhD (Toronto), PEng

Professor, Vice President Academic
T.A. Brzustowski, BASc (Toronto), AM, PhD (Princeton), PEng

Professor, Associate Dean, Graduate Studies, Faculty of Engineering
A. Plummer, BSc, PhD (Nottingham), PEng, CEng, RM

Professor, Associate Chairmen Graduate Studies
P.J. Pick, BASc (British Columbia), MSc (Imperial College), PhD (Waterloo), PEng

Professor, Associate Chairman Undergraduate Studies
G.E. Schneider, BASc, MASC, PhD (Waterloo)

Professor, Director, Office of Research Administration
E.L. Holmes, BSc (Bristol), MASC, PhD (Toronto), PEng

Professors
K.G. Adams, BSc (Queen’s), MASC, PhD (Waterloo), PEng
G.M. Bragg, BASc (Toronto), PhD (Cambridge), PEng
E. Brundrett, BSA (Ontario Agricultural College), BASc, MASC, PhD (Toronto), PEng

D.J. Burne, BSc, PhD (Bristol), PEng, CEng
R.N. Dubey, BSc (Hons.), (Patna), BSc (Eng) (Bihar), PhD (Waterloo), PEng
D. French, BSc (Aston), CEng, PEng
K.G.T. Hollands, BASc (Toronto), PhD (McGill), PEng
J.H.G. Howard, BASc (Queen’s), MSC, PhD (Birmingham), PEng
W.H. Hui, 1 BSc (Peking), PhD, DSc (Southampton)
H.H.E. Leipholtz, F Dipl Eng, Dr Ing, Docent Habilit (Stuttgart), FRSC, PEng, Recipient of the Distinguished Teacher Award
H.R. Martin, BSc, MSc (Queen’s Belfast), PhD (Nottingham), DSc (Queen’s Belfast), PEng
P. Niessen, BSc (McMaster), MASC, PhD (Toronto), PEng
G.F. Pearce, BASc (British Columbia), MASC (Toronto), PEng, (Retired)*
K.R. Piekarski, Dipl Ing (London), PhD (Cambridge), PEng, (Retired)*
G.D. Raihday, BSc, MSc (Western Ontario), PhD (Minnesota), PEng, Recipient of the Distinguished Teacher Award
J.A. Schey, Dipl Ing, CSC (Budapest), PEng
P.R. Swallow, BASc, MASC, PhD (Waterloo), PEng
Y.A. Stepanenko, (Moscow Inst. Machine Tool Eng), PhD (Engineering Research Inst., Moscow)
A.B. Strong, BASc (Waterloo), MSc (London), PhD (Waterloo), PEng
H.F. Sullivan, BASc (Waterloo), AM, PhD (Princeton), PEng
M.M. Yovanovich, BSc (Queens), MS (Buffalo, ME, ScD (Massachusetts Institute of Technology)

Associate Professors
G.C. Andrews, BASc, MASC (British Columbia), PhD (Waterloo), PEng
G.A. Davidson, BASc, PhD (Toronto), PEng
A.M. Hale, BSc, MA (New Brunswick), BASc (Toronto), MASC, PhD (Waterloo), PEng
U.H. Mohaupt, BASc, MASC, PhD (Waterloo), PEng

Assistant Professors
R. Hoff, BASc, MASC (Waterloo), PhD (Vanderbilt), NSEF University Research Fellow, PEng
J.A. Haasoon, BSc, PhD (Trinity College, Dublin)
F.M. Ismail, BSc, MSC (Alexandria), PhD (McMaster)
J.B. Medley, BASc, MASC (Waterloo), PhD (Leeds), PEng
M. Rentsisbult, BSc (Robert), MSc (Middle East Technical), PhD (Northwestern), PEng
Course Descriptions

Mechanical Engineering

G.D. Stubble, BASc (Waterloo), MSc (Stanford), PhD (Waterloo), PEng
R.A. Varin, MSc, PhD (Warsaw Technical)
D.C. Weckman, BASc, MSc, PhD (Waterloo), PEng

Research Assistant Professors
A.P. Brunger, BASc, ME, PhD (Toronto)
A. Sobiesiak, MSc, DrTechSc (Warsaw Tech)

Adjunct Professors
C.J. Beingessner, BSc, MASc, PhD (Toronto), PEng
R.G.R. Lawrence, QC

Faculty Members holding cross appointments to Mechanical Engineering from:
1. Applied Mathematics
2. Civil Engineering

* Also has Adjunct Appointment

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.

Course Descriptions

ME 201 F,W 3C,1T 0.5
Advanced Calculus

ME 202 F,W 3C,1T 0.5
Statistics for Engineers

ME 215 F,W X,3L 0.5
Introduction to Mechanical Engineering

ME 220 S,F 2C,1D,1T 0.5
Mechanics of Deformable Solids 2

ME 250 F,S 3C,1T 0.5
Thermodynamics 1

ME 262 3C,2T,3L
Introduction to Microprocessors and Digital Logic

ME 216 W.S 2C,4L 0.5
Mechanical Engineering 2

A continuation of GEN E 115 with applications of graphics, measurement and other analytic principles 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 115

ME 200 F,W 1C 0.0
Introduction to Mechanical Engineering 1

Discussion of Structure of Mechanical Engineering curriculum, operation of Department, Faculty, University, technical societies.

ME 201 F,W 3C,1T 0.5
Advanced Calculus

ME 202 F,W 3C,1T 0.5
Statistics for Engineers

ME 215 F,W X,3L 0.5
Introduction to Mechanical Engineering

ME 220 S,F 2C,1D,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 superposition, energy theorems, theories of failure, elastic and inelastic analysis of symmetrical bending, torsion of circular members, columns and stability, and virtual work.

ME 250 F,S 3C,1T 0.5
Thermodynamics 1


ME 262 3C,2T,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.

ME 300 W.S 1C 0.0
Introduction to Mechanical Engineering 2

Technical specialties in Mechanical Engineering, discussion of options, curriculum, seminars and technical topics in the various options.

ME 304 W.S 3C,1T 0.5
Numerical Analysis

A survey of numerical procedures with emphasis upon computer implementation using the WATFIV programming language. 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.

M E 321 W,S 3C,1L 0.5
**Kinematics and Dynamics of Machines**

M E 322 F,W 3C,1T,1L 0.5
**Mechanical Design 1**
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,3L 0.5
**Control of Properties of Materials**

M E 340 F,W 3C,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,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,2T,1L 0.5
**Heat Transfer**
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. Introduction to the kinetic theory of gases.

M E 360 F,W 3C,2T,1L 0.5
**Introduction to Control Systems**

M E 362 F,W 3C,1T,1L 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 400 F,S 1C 0.0
**Introduction to Mechanical Engineering**
Research frontiers in Mechanical Engineering, specific discussion of research done at Waterloo, seminars by members of research group.

M E 401 F,S 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 402 W 2C,2T 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 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 F,S 3C 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.
ME 435 F,S 3C 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.

ME 447 F,S 3C 0.5
Automation and Robotics
The principles of automatic machinery and computer controlled industrial processes. Introduction of automation to the workplace and its impact on production, costs and labour. Computer modelling of the production process. Review of robot types, their characteristics and sensor technology related to their use. Industrial process control, the use of computers and programmable controllers in industrial environments. Case studies in automatic machine design, component feeders and parts handling.

ME 448 F.W 3C,2T 0.5
Production Engineering: Design of Manufacturing Systems
The interaction and relationship of manufacture to the factory organization. Product design and development, planning and control of production. Principles of mass and flow production, Machine loading and line balancing. Design analysis and evaluation techniques of plant layout and materials handling systems as basic components of a manufacturing facility and system.
Equivalent to M SCI 432

ME 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 of loads on buildings; effects of the thermal environment; air conditioning and calculations, air flow in and around buildings, diffusers.

ME 456 F,S 3C 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.

ME 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.

ME 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. Reversions and their selection.

ME 468 F,S 3C 0.5
Introduction to the Environmental Sciences
ME 533 W 3C 0.5
Composite Materials

ME 534 F,S 3C 0.5
Non-metallic Materials

ME 541 W 3C,1L 0.5
Deformation Processes

ME 542 W,S 3C 0.5
Machine Tool Analysis

ME 543 W 3C 0.5
Metal Casting Processes
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.

ME 544 F,W 3C 0.5
Welding
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.

ME 548 F,S 3C,4L 0.5
Numerical Control of Machine Tools 1

ME 557 W 3C 0.5
Combustion 1
Combustion thermodynamics; Introduction to chemical kinetics of combustion; Combustion properties of fuels; Flammability of combustible mixtures. Flame propagation mechanisms, pre-mixed and diffusional; Stability of flames; Introduction to combustion aerodynamics, jet flames; Atomization; Droplet and spray combustion; Elementary ignition concepts and theory. Basic detonation theory.

ME 559 F,S 3C 0.5
Finite Element Methods
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 subrouline construction as the course progresses.

ME 561 F,S 3C 0.5
Fluid Power Control Systems

ME 563 W 3C 0.5
Turbo Machines

ME 564 W 3C 0.5
Aerodynamics
An introductory course in aerodynamics for engineers. Kinematics and dynamics of inviscid flow; airfoil dynamics including thin airfoil theory, finite wings, panel methods and airfoil parameters. Boundary layer theory and boundary layer control as applied in aerodynamics. Introduction to high speed aerodynamics. Introduction to dynamics of flight including stability and control.

ME 566 W 3C 0.5
Gas Dynamics
Basic laws of compressible fluid flow. Wave propagation in compressible fluids, isentropic flow of a perfect gas, normal and oblique shock waves. Prandtl-Meyer flow. Flow in ducts and over bodies, flow with friction (Fanno) and heat transfer (Rayleigh), imperfect gas effects, measurement of compressible flows, use of formulae, charts and tables, introduction to the method of characteristics.

ME 566 F,S 3C 0.5
Fluid Mechanics 3
Middle East Studies

Associate Professor and Director
D.J. Sana, BA (Athens), STM (Indianapolis), PhD (Harvard), Department of Religious Studies

Associate Professor and Assistant Director
W. Man, BA, BSW (McGill), MSc, DSW (Western Reserve), School of Urban and Regional Planning

Professors
A. Kapur, BA (Punjab), MA (George Washington), PhD (Carleton), Department of Political Science
R.H. Sima, AA Honors Dip (London), RIBA, MAAH, School of Architecture

Associate Professors
J.T. Horton, BA (Wheaton), MA (Northwestern), School of Urban and Regional Planning
R. List. BA, MA, PhD (Toronto), Department of English
J.W. Miller, BA (Goshen), MA (New York), BD (Princeton), ThD (Basel), G, Department of Religious Studies
F. M. Nazib, BSc (Washington), MSc (Oregon), PhD (Ouens), Department of Economics
J.S. North, BA, MA (British Columbia), PhD (Alberta), Department of English

Assistant Professor
J.A. Teichman, BA, MA, PhD (Toronto), Department of Political Science

Resource Persons

Professors
M.J. Elmesry, BSc (Cairo), MASc, PhD (Ottawa), PEng, Department of Electrical Engineering
V.K. Handa, BSc (Calcutta), BSc (Eng) (London), MSc (Queen's), MAC, PhD (Waterloo), PEng, Department of Civil Engineering
W.C. Lennox, BASc, MSc (Waterloo), PhD (Lehigh), PEng, Dean of Engineering
G.D. Saleh, BA (Cairo), MA, PhD (Case Western Reserve), Department of Management Sciences

G refers to faculty members at Conrad Grebel College

Course Descriptions

Middle East Studies

MES 302 0.5
Directed Studies in the Middle East
This is an independent, directed studies project on a Middle East topic. Each student will select an appropriate advisor, agree on a topic, obtain approval from the MES Director of the Program, and work with the advisor.

Prereq: Third- or fourth-year standing and at least five courses from the Approved List of MES Courses.

Music

Assistant Professor, Chairman
L. Enns, ARCT (Toronto), BSM (CMBC), BMus (Wilfrid Laurier), MMus, PhD (Northwestern)

Associate Professors
H. Martens, ARCT (Toronto), LRSM, BA, MA (Minnesota), PhD (Columbia)
W.R. Maust, BS (EMC), BMus (Peabody Conservatory), MMus, PhD (Indiana)

Assistant Professor
K. Hull, ARCT (Toronto), BA (Waterloo), BMus, MMus (Western Ontario), MFA (Princeton)
C. Weaver, BMus, MMus, DMus (Indiana)

Part-time Lecturers
G. Holmes, BSc (Columbia)
D. Huron, BS (Waterloo)
W. Janzen, BMus (Manitoba), MMus (Wisconsin)
M. Jarrett
A. Martin, ARCT, BMus (Toronto), MMus (Eastman)
V. Sawa, BMus (McGill), MM (New England Conservatory, Boston)
M. Wood

Studio Instructors
Hans Bauer, Vienna State Academy, Juliusliard, Violin
Cedric Coleman, BM, MM (New England Conservatory, Boston), Bassoon
Gisela Depkat, Cello
Denny Gangbar, Classical Guitar
George Greer, BMus (Toronto), Double Bass
Douglas Haas, Kantor (Stuttgart), Harp
Carolyn Hagedorn, Flute
Course Descriptions

Music

MUSIC 100 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. MUSIC 150 and MUSIC 151 together may serve in lieu of MUSIC 100 as prerequisite for upper-level Music courses.

MUSIC 101 F,W,S 2L 0.25
Music Ensemble
The study of selected music literature through rehearsals and performance in one of the Music Department's ensembles: Oratorio Choir, Chapel Choir, Chamber Choir, Concert Band, Stage Band, Chamber Ensembles, Chamber Orchestra. Regular attendance at rehearsals and performances is required. Offered on a credit/fail basis.

MUSIC 102 F,W,S 2L 0.25
Music Ensemble
See MUSIC 101 for course description.

MUSIC 102 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.

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 150 F 3C 0.5
Survey of Music History 1
An introduction to music from early Christian chant to Beethoven through listening, lectures, discussion and analysis. 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 151 W 3C 0.5
Survey of Music History 2
An introduction to the music of the 19th and 20th centuries through listening, lectures, discussion and analysis. Compositions include symphonies, concertos, chamber music, operas, electronic and computer music. Prereq: MUSIC 150 or consent of instructor.

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 F,W,S 2L 0.25
Music Ensemble
See MUSIC 101 for course description.

MUSIC 202 F,W,S 2L 0.25
Music Ensemble
See MUSIC 101 for course description.
MUSIC 264  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 265  F  3C  0.5
Piano Literature
A study of the music written for solo piano from the 17th century to the present.
Prereq: MUSIC 100 or consent of instructor

MUSIC 266  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  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 in Canada, chanson de Québec, the songs commemorating the great events of Canada’s history, and songs of work and pleasure.

MUSIC 273  F  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.

MUSIC 274  W  3C  0.5
Introduction to Jazz
A survey of 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  S  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 280  W  3C  0.5
Canadian Music
An historical study of the development of music in Canada from colonial times to the present, with particular emphasis on the composers and music of the 20th century.
Prereq: MUSIC 100 or consent of instructor

MUSIC 301  F,W,S  2L  0.25
Music Ensemble
See MUSIC 101 for course description.

MUSIC 302  F,W,S  2L  0.25
Music Ensemble
See MUSIC 101 for course description.

MUSIC 355A/355B  S  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

MUSIC 366  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  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 the harmonic, melodic and formal aspects of 19th century music. Ear-training and sight-singing lab sessions will cover chromatic chord progressions and modulatory melodies.
Prereq: MUSIC 251 or consent of instructor
MUSIC 400A/B 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 1987-88

MUSIC 264 Vocal Literature  
MUSIC 332 Musical Aesthetics and Criticism  
MUSIC 333 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  
G.C. Woo, OD (College of Optometry of Ontario), MS, PhD (Indiana), LOSc (Melbourne), FVCO, FAAO, Dipl-V  
M.E. Woodruff, OD (College of Optometry of Ontario), PhD (Indiana), FAAO  

Associate Professors  
R.D. Beauchamp, MA, PhD (Brown)  
M.G.E. Callender, BSc (Sir George Williams), OD (College of Optometry of Ontario), MSc (Waterloo), MPhil (Aston), FAAO  
J.V. Lovasik, BSc (McGill), OD, MSc, PhD (Waterloo), FAAO  
D.A. Ranney, BA, MD (Toronto), FRCS (England)  
R.D. Sein, BA (Queen's), PhD (Waterloo)  

Assistant Professors  
B.R. Chou, BSc (Toronto), OD, MSc (Waterloo), FAAO  
J.G. Flanagan, BSc (Optom), PhD (Aston)  
J.K. Hovis, OD, MS (Ohio State), PhD (Indiana)  
J.G. Strong, OD, MSc (Waterloo), Chief of Clinics  
M.G. Campbell, BSc: (Toronto), MSc (Waterloo), PhD (ANU), FAAO, NSERC University Research Fellow  

Adjunct Faculty  
I. Baker, OD (College of Optometry of Ontario), FAAO  
E.L. Buchnar, OD (College of Optometry of Ontario)  
S. Hoffman, MD, DPH (Toronto)  
R.G.R. Lawrence, O.C.  
T. Liu, BSc, MB BS (Sydney), FRACP, FRCP (C)  
W.M. Lyle, OD (College of Optometry of Ontario), MS, PhD (Indiana), FAAO  
M.J. Samek, OD (College of Optometry of Ontario), MSc (Waterloo)  

Clinical Faculty  
D.B. Buck, OD (College of Optometry of Ontario), FAAO  
D. Fonn, Dip Optom (S.A.), M Optom (NSW), FAAO  
R. Pace, OD (Waterloo), FAAO  
A.D. Potton, BS (Adelaide), OD (Pennsylvania College of Optometry)  
K.M. Robertson, OD, MSc (Waterloo), FAAO  
L. Sorbara, OD (Waterloo)  
R.C. Trevino, BA (Maryland), OD (Illinois College of Optometry)  
R. Wiggins, BS, OD (Indiana), FAAO  

Senior Demonstrator  
D.J.H. Thompson, BA (Waterloo)  

Faculty Members of Optometry holding cross appointments to:  
1. Biology  
2. Systems Design Engineering  
3. Kinesiology  
4. Psychology  
Clinical Associates - Part-time (1996-87)  
W.B. Andrews, OD (Waterloo)  
W.R. Andrews, OD (College of Optometry of Ontario)  
J. Benod, OD (Waterloo)  
A. Bernardi, OD (Waterloo)  
D.R. Book, OD (Waterloo)  
R.R. Rock, OD (College of Optometry of Ontario)  
A. Brisson, OD (College of Optometry of Ontario)  
B.E. Caffery, BA (Carleton), OD (New England College of Optometry), FAAO  
J. Capell, OD (Waterloo)  
R.R. Chan, OD (College of Optometry of Ontario)  
K. Chhatwal, OD (Waterloo)  
D. Currie, OD (Waterloo)  
W.R. Derus, OD (Waterloo)  
J.L. Dippel, OD (Waterloo)  
P. Devanny, OD, BSc (Waterloo)  
A.M. Erdie, OD (Waterloo)  
G. Gies, OD (Waterloo)  
D.R. Goemans, OD (Waterloo)  
G.A. Grant, OD (College of Optometry of Ontario), FAAO  
K. Hadley, OD (Waterloo)  
E. Irving, OD (Waterloo)  
S. Lam, BSc (Glasgow College of Technology), OD (Waterloo), FBCO  
B. Levy, Dip Optom (S.A.), OD (California-Berkeley), MSc (Waterloo), FAAO  
D. Lutzi, OD (Waterloo)  
R.E. Miller, BSc (Toronto), OD (Waterloo)  
B. Pierce, OD (Waterloo)  
M. Pollock, OD (Waterloo)  
R.L. Saen, OD (Waterloo)  
B. Sanger, BSc, OD (Waterloo)  
R.J. Scheid, OD (Waterloo)  
C. Spiegel, OD (Waterloo)  
V. Timpano, OD (Waterloo)  
J.S. Walcott, OD (Waterloo)  
P. Wheler, OD (Waterloo)  
J. Wilkinson, BSc (University of Kent at Canterbury), OD (Waterloo)  
R.L. Wilson, OD (Waterloo)  
R. Zazz, BSc, OD (Waterloo)
Course Descriptions

Introductory Note
Students in other disciplines may register for Optometry courses only upon the approval of the Director of the School of Optometry.

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 and Associated Structures
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
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 2C,1T 0.5
Light and Illumination
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 surveys.

OPTOM 111 W 3C,3L 0.5
Physiological Optics
Prereq: OPTOM 106

OPTOM 114 W 3C,2L 0.5
Anatomy of the Eye and Associated Structures
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 116 W 3C,4L 0.5
Ophthalmic Optics 1
Properties of optical glass and plastic, single vision lenses and prisms, lens combinations. Optics of contact lenses and clinical instruments. Ophthalmic laboratory procedures.
Prereq: OPTOM 106

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, innervation 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 F 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 of primary and secondary ocular disease; instrument techniques; record keeping, patient counselling, referral procedures; management of ocular emergencies; primary health care responsibilities.
Prereq: OPTOM 105/115

OPTOM 246 F 3C,4L 0.5
Ophthalmic Optics 2
Prereq: OPTOM 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 W 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. Inherited conditions of particular interest, e.g., colour vision, albinism, aniridia, refractive error, retinoblastoma. Genetic counseling, and the detection of carriers.
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
The lecture course deals with problems involved in selecting, preparing and fitting ophthalmic materials. Optical, cosmetic and comfort requirements, and patient counseling are considered. Labs provide experience in preparing and fitting materials to patients.
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, they are exposed to the provision of contact lens, binocular vision, ocular health and optical services.
Prereq: OPTOM 242, 252

OPTOM 350 W 4C 0.5
Optometrical Jurisprudence and Practice Management

OPTOM 351 W 3C,3L 0.5
Physiological Optics
Prereq: OPTOM 261

OPTOM 352 W 3C,2L 0.5
Clinical Optom: Strabismus and Orthoptics
Detection and evaluation of sensory and motor characteristics of vision in strabismus. Classifications, diagnosis, prognosis, modes of therapy for strabismus and amblyopia.
Prereq: OPTOM 242, 252, 342

OPTOM 353 W 2C 0.5
Optometric Communication
A series of lectures and role-playing exercises designed to enhance the student's skills in verbal and written communication with patients and other professionals.

OPTOM 354 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 355 W 30 Clinic 1.0
Each student is required to complete 120 hours of clinical practice during the Spring.
Prereq: Successful completion of Year Three

OPTOM 356 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. Application of proprietary preparations to the eye including contact lens products.
Prereq: OPTOM 245, 255

OPTOM 372 W 2C 0.5
Pediatric Optometry
Special aspects of the management of vision problems of infants and young children.
Prereq: OPTOM 242, 252

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 24 Clinic 0.5/0.5
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, electro-diagnostic, 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. These exams may be considered by the Council of the College of Optometrists of Ontario to constitute part of the Ontario licensure requirements.
Prereq: OPTOM 348 A/B, 358

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
Optometry courses

Tracts of Ontario to constitute part of the winter term, fourth professional year.

Ontario licensure requirements.

by the Council of the College of Optometry.

examinations which may be considered upon the successful completion of these examinations.

Graduation in Optometry is contingent upon the successful completion of these examinations which may be considered part of the Ontario licensure requirements.

Prereq: Successful completion of all previous Optometry courses.

Optometry courses

Environmental Vision

Aspects of prevention of accidents and injury to the visual system. The production of efficient and comfortable vision at work and recreation.

Vision Care Projects

Between the third and fourth professional years, students will be required to participate in vision care projects of varying durations. These will be arranged by faculty.

Prereq: Successful completion of OPTOM 348, 358.

Optometry courses

Special Populations


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

Optometry courses

Comprehensive Examinations

Written comprehensive examinations in Anatomy and Physiology, Pathology and Pharmacology, Physiological Optics, Ophthalmic Optics, and Optometry are held in the final exam period of the winter term, fourth professional year.

Graduation in Optometry is contingent upon the successful completion of these examinations which may be considered by the Council of the College of Optometrists of Ontario to constitute part of the Ontario licensure requirements.

Prereq: Successful completion of all previous Optometry courses.

Peace and Conflict Studies

Assistant Professor, Chairman of the Program

C.A. Snyder, BA (Waterloo), MA, PhD

McMaster, G

Lecturer, Undergraduate Officer

T.R. Yoder Neufeld, BA (Manitoba), MDiv

(Harvard) G

Members of the Peace and Conflict Studies Faculty Group

Professors

K. Westhues, BA (Conception), MA, PhD

(Vanderbilt)

Associate Professors

C.G. Brunk, BA (Wheaton), MA, PhD

(Northwestern) G

J.G. Holmes, BA, MA (Carleton), PhD

(North Carolina)

S. Kumar, BSc, MSc (Punjab), MA, PhD

(Toronto)

M.F. McDonald, BA (Toronto), MA, PhD

(Pittsburgh)

R.J. Sawatsky, BA (Bethel), MA (Minnesota), MA, PhD (Princeton) G

J.O. Stubbs, BA (Toronto), MSc Econ (London), DPhil (Oxford)

A.F Thompson, BA (Toronto), BTh (Huron), MA (Western Ontario), STM, PhD (McGill)

Assistant Professors

W.B. Moul, BA, MA, PhD (British Columbia)

M. Smyth, BA (Toronto), MA, PhD (York) G

Institute of Peace and Conflict Studies

Director

R.J.R. Mathies, BA (Waterloo), MSc (Guelph), EuD (Carleton) O.I.S.E. G

Research Associate

E.E. Regehr, BA (Waterloo), Funded by Project Ploughshares G

Course Descriptions

Peace and Conflict Studies

A) Core Courses

PACS 201 F 2C, 1D 0.5

Roots of Conflict and Violence

An examination of the influential theories of the nature and roots of human conflict on both the interpersonal and intergroup level. Contributions of the behavioural and social sciences, as well as the humanities, will be explored.

PACS 202 W 2C, 1D 0.5

Conflict Resolution

Special emphasis on the means of conflict resolution or management. Included are critical assessments of negotiation, arbitration, confrontation, litigation, violence and nonviolent resistance, and other models of conflict resolution.

PACS 301A-F F 3C 0.5

Special Topics in Peace and Conflict Studies 1

A seminar course investigating special issues related to peace and conflict. The content of this and PACS 302 will vary from year to year as specialists in various aspects of these issues are invited to teach the courses.

PACS 302A-F W 3C 0.5

Special Topics in Peace and Conflict Studies 2

Same as 301 above.

PACS 498 F T 0.5

Senior Honours Seminar 1

Each Honours student will work on a research paper and will meet regularly with other students working on similar projects to discuss and evaluate their own work.

PACS 499 W T 0.5

Senior Honours Seminar 2

Continuation of PACS 498.

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.
Course Descriptions
Personnel and Administrative Studies

PACS 250 F 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, causes and predictability of war, United Nations voting patterns, disarmament studies and peace activism.

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, Canadian membership in a nuclear alliance and other defence agreements, and Canadian initiatives in arms control and disarmament.

PAS 200 F 1L,2T 0.5
Basic Personnel Administration
Examines the management environment in which personnel administration takes place. Includes some of the organizational theories and motivational theories on which personnel administration is based. Students have the opportunity to develop operational skills in the basic technical areas of personnel administration, and to examine the organizational development responsibilities often assigned to Personnel Departments.

PAS 300 W 3S 0.5
Concepts and Issues in Personnel Administration
Offers students an opportunity to converse, in a seminar setting, with people who have achieved a senior leadership role in the fields of personnel, management, government, labour relations, and organizational change. Each seminar will address a major conceptual, social or policy issue in the broad field of employee relations.

Department of Philosophy

Associate Professor, Chairman of the Department
B.P. Hendley, BA (Marquette), MA, PhD (Yale)

Professor, Associate Dean, Graduate Affairs, Faculty of Arts
R.A. George, MA, PhD (Michigan State)

Associate Professor, Associate Chairman and Graduate Advisor
R.H. Holmes, BA, MA (Montana), PhD (Washington)

Professor, Associate Chairman and Undergraduate Advisor
E.J. Ashworth, BA, MA (Cambridge), PhD (Bryn Mawr)

Professors
L.L. Haworth, BA (Rollins), MA, PhD (Illinois)
J.R. Home, BA, MA (Western Ontario), BTh (Huron), PhD (Columbia)
J.S. Minas, BA (Wayne), PhD (Illinois) (on leave)
J.F. Narveson, BA (Chicago), MA, PhD (Harvard)
D.D. Roberts, BA (Roosevelt), MA, PhD (Illinois)
B.H. Suits, BA, MA (Chicago), PhD (Illinois), Recipient of the Distinguished Teacher Award
J.W. Tucker, BS, BA, PhD (London)

Associate Professors
W.R. Abbott, BA (Kenyon), PhD (Ohio State)
C.G. Brunk, BA (Wheaton), MA, PhD (Northwestern), G
G.T. Campbell, BA (Western Ontario), PHL, PhD (Laval), J, Recipient of the Distinguished Teacher Award
F. Centore, BSc (Canisius), MA (Maryland), PhD (St. John's) J
D.T. DeMarco, BS (Stonehill, Mass.), MA, PhD (St. John's) J
A. Kerr-Lawson, BA (Toronto), MA (Chicago), PhD (McMaster)
M.F. McDonald, BA (Toronto), MA, PhD (Pittsburgh)
A.C. Minas, BA, MA, PhD (Harvard)
J.W. Van Evra, BA (Valparaiso), MA, PhD (Michigan State)

Assistant Professors
J.A. Novak, BA (DePaul), PhD (Notre Dame)
J. Wubnig, BA (Swarthmore), MA, PhD (Yale)
Facility members holding joint appointments to Philosophy from:
1Pure Mathematics
G refers to faculty members at Conrad Grebel College
J refers to faculty members at St. Jerome's College

Course Descriptions

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 J F,W 3C 0.5 Introduction to Philosophy
A broad selection of the main problems in philosophy will be considered. For example: How can we know whether anything is right or wrong? How can we know about things we cannot directly observe? Can we know whether there is a God? Is mind in any sense distinct from matter?

PHIL 101 X F,W,S 3C 0.5 Introduction to Philosophy
A general introduction, designed to provide the student with an understanding of the major problems of classical and contemporary philosophy.

PHIL 102 F,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 102B F,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 102 C F,W 3C 0.5 Philosophy of Life
"Who am I?" "What can I hope for after death?" "How can I tell 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 118 J A,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 120 J 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 130 J 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 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 200 A/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 200 A F,S 3C 0.5 Great Works of Western Philosophy: Part 1
Outstanding works from the ancient and medieval periods.

PHIL 200 B W 3C 0.5 Great Works of Western Philosophy: Part 2
Outstanding works from the early modern and contemporary periods.

Either PHIL 200 A or PHIL 200 B may be taken separately.

PHIL 201 J 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 J 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 J F,W 3C 0.5 Philosophy of Women
A study of some philosophical issues concerning women; the sexes, gender, and androgyny; the position of women in the work force, public life and family; marriage and its alternatives; sexuality, childhood.

PHIL 203 J 3C 0.5 Philosophical Perspectives on Death
This course critically examines how philosophers from the Pre-Socratics to Wittgenstein have analyzed the concept of death. The course is also concerned with topics like the concept of a person, personal identity, and survival after death.
PHIL 204 J W 3C 0.5
Philosophy and Culture
An analysis of the philosophical assumptions in Western culture as reflected in various mass media and in current modes of production and consumption.

PHIL 205 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 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 210 F 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
Philosophy of Man
What is Man? What is man's place among other creatures? Is man an accident of evolution? What are the major views on man as a species? How are love and sex aspects of man's life?

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 216 W 3C 0.5
Rational Behaviour and Decision-Making
An elementary introduction to the subject of 'rational' behaviour and decision-making for individuals and groups. Emphasis is on the definition and measurement of utility functions and various criteria employed in models of decision-making. This course is intended to help those whose work will involve them in making decisions in either the public or private sectors.

PHIL 218 J F 3C 0.5
Ethical Theory
A normative approach, employing several of the classic Western traditions of rational thought, to general ethics. The various schools of ethical thought will be discussed.

PHIL 219 J W 3C 0.5
Practical Ethics
This course will discuss the applications of general ethics to more specific areas of human endeavor. Among the topics discussed will be abortion, contraception, sex, obscenity, violence, drugs, egoism, dishonesty, and various forms of human exploitation.

PHIL 220 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 221 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 224 W 3C 0.5
Mankind and Nature
A philosophical study of the relationship between mankind and nature: historical and current philosophies of the natural world, including the place and responsibilities of human beings; problems of ecological imbalance and collapse.

PHIL 225 3C 0.5
Social and Political Philosophy: Canadian Problems
Basic ideological perspectives—conservative, socialist, and liberal—on Canadian problems such as native rights, nationalism, separatism, and regionalism are philosophically presented and assessed.

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, behavior control (e.g. psychosurgery, behavior modification and psychotherapy), human experimentation (including "informed consent" and fetal research) and genetic engineering.

PHIL 230 J S 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 237 3C 0.5
Introduction to the Philosophy of Religion
A critical discussion of basic religious concepts. Among the topics covered will be faith, miracles, religious experience, immortality, and arguments for the existence of God.

PHIL 241 F.W.S. 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.

PHIL 242 W 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, necessity, 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 258 F 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 lawlikeness, the grounds for scientific confirmation, and the debate between rationalism and empiricism in science.

PHIL 295 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 300X F 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 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 practice. 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

PHIL 319 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 relation to political community.  
Prereq: One course in moral philosophy or consent of instructor.

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 3C 0.5  
Philosophy of Law: Part 1  
An investigation of alternative views of law and legal reasoning forms the core of this course. Law's relations to morality, social practice, and politics are considered. Important legal judgments as well as leading philosophers of law will be considered.

Prereq: At least second-year standing or consent of instructor
PHIL 362 W 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 385 3C 0.5
Oriental Philosophy
Studies of a selected area of non-western Philosophy (e.g. Indian or Chinese). Parallels will be drawn between modes of Eastern thinking and European conceptions with emphasis on essential differences as well as similarities.
   Prereq: Consent of instructor

PHIL 386 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 388J-387J 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 and permission of College Discipline Coordinator

PHIL 418J W 3C 0.5
Ethics and Society
This course examines the nature and purpose of community living as well as such traditionally controversial issues as private and public morality, the individual good and the common good, personal freedom and group responsibility.
   Prereq: One course in moral philosophy or consent of instructor

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 F 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 424 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 F 3C 0.5
Logical Theory
The first part of PHIL 440.

PHIL 440B W 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, P MATH 430A

PHIL 451J W 3C 0.5
Being and Existence
An advanced course for the serious student, delving into 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 455 3C 0.5
Metaphysics 1: Ontology
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 456 3C 0.5
Metaphysics 2: Cosmology
Metaphysical problems in the areas of space, time and motion.
   Prereq: Consent of instructor
PHIL 493 3C 0.5
Philosophy of Language
Issues in the philosophy of language, such as synonymy, propositions, meaning, semantics, reference.
Pre req: At least two term courses in philosophy or consent of instructor

PHIL 494 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.
Pre req: At least two term courses in philosophy or consent of instructor

PHIL 495 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.
Pre req: 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.
Pre req: Two term courses in Philosophy or consent of instructor

PHIL 471-474 3C 0.5
Special Subjects
One or more term courses will be offered at different times, as announced by the Department.
Pre req: Consent of instructor

PHIL 495 W 2C 0.5
Undergraduate Seminar
Advanced study of recent works or selected areas of Philosophy. The topic will be announced each year.
Restricted to undergraduates.

PHIL 496J-497J F.W 0.5 each
Special Topics/Directed Readings
A series of readings and/or seminars on 1 or 2 topics or thinkers, with periodic reports and discussions.
Pre req: Consent of instructor and permission of College Discipline Coordinator

PHIL 498A-N F.W.S R 0.5
Directed Reading in Special Areas
Pre req: 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.S 0.5
Tutorial and Honours Essay
Students wishing to enrol in 499J should consult the St. Jerome's College Discipline Coordinator.
Pre req: PHIL 499A

COURSES NOT OFFERED 1987-88
PHIL 206J Philosophy of Science
PHIL 260J Issues in Higher Education
PHIL 333J Contemporary Philosophical Problems in Art

Department of Physics

Professor, Chairman of the Department
J. Grindlay, BSc (Glasgow), DPhil (Oxford)

Associate Professor, Associate Chairman of the Department
* D. Hemming, BSc, PhD (Bristol)

Professor, Dean of the Faculty of Science
D.E. Brodie, BSc, MSc, PhD (McMaster)

Associate Professor, Associate Dean, Undergraduate Studies, Faculty of Science
H.M. Morrison, BSc, PhD (Edinburgh)

Professor, Graduate Officer
I.R. Dagg, BSc (Manitoba), MS (Pennsylvania State), PhD (Toronto)

Associate Professor, Graduate Officer
J.K. Brandon, BSc, PhD (McMaster), MA (Cambridge)

Professor, Undergraduate Officer
J.A. Cowen, BSc (Manitoba), MA, PhD (Toronto)

Associate Professor, Undergraduate Officer
K.A. Woolner, BSc (London)

Professor Emeritus
W.B. Pearson, DFC, MA, DSc (Oxford), FRSC, FOC

Professors
A. Anderson, MA, DPhil (Oxford)
R.A. Aziz, BA, MA, PhD (Toronto)
F.W. Boswell, BA, MA, PhD (Toronto)
S.G. Davison, PhD, DSc (Manchester)
M.P. FitzGerald, BSc, MSc (Toronto), PhD (Oxford)
F.O. Goodman, BSc, PhD, DSc (London), FInstP, FAIP
N.R. Iensen, BSc (Copenhagen), MSc, PhD (McMaster)
J. Knutv, BSc (Waterloo), PhD (Western Ontario)
J.D. Leslie, BSc (Toronto), MS, PhD (Illinois)
R.A. Moore, BSc, MSc (McMaster), PhD (Alberta)
A.D.S. Nagi, BA, BSc, MSc (Punjabi), PhD (Delhi)
J.L. Ord, BSc (Toronto), MS, PhD (Illinois)
R.K. Pathria, BSc, MSc (Punjabi), PhD (Delhi), Recipient of the Distinguished Teacher Award
M.M. Pintar, BSc, MSc, PhD (Ljubljana)
L.W. Reeves, BSc, PhD, DSc (Bristol), FRSC, FOC
H.J.T. Smith, BSc, PhD (London)
R.A. Snyder, BSc, PhD (Western Ontario)
S.F. Wang, DSc (Nagoya)

Associate Professors
J.M. Corbett, BSc (Toronto), MSc, PhD (Waterloo)
A.E. Dixon, BSc (Mt. Allison), MSc (Dalhousie), PhD (McMaster)
P.C. Eastman, BSc, MSc, PhD (McMaster), PhD (British Columbia)
H.K. Ellenton, BSc (Western Ontario), MA (Toronto)
G.L. Harris, BA (Mount Holyoke College), MA (Wesleyan), PhD (Toronto)
J.R. Lepock, BS, MS (Virginia), PhD (Pennsylvania State)
S.P. Lepheitz, BSc (Natal), MSc (South Africa), PhD (Witwatersrand)
W.K. Liu, BS, MS, PhD (Winston), NSERC University Research Fellow
H. Peermod, BSc (Winnipeg), MSc (Victoria), PhD (Waterloo)
B.H. Torrie, BSc (Toronto), PhD (McMaster)
J. Vanderkooy, BEng, PhD (McMaster)
P.S. Wesson, BSc (London), PhD (Cambridge), FRAS, NSERC University Research Fellow

Assistant Professors
M. Fich, BSc (Waterloo), MSc, PhD (California, Berkeley)
J.W. Hepburn, BSc (Waterloo), PhD (Toronto), NSERC University Research Fellow
D. Nubes, BSc, MSc, PhD (Toronto)

Research Assistant Professor
G. Scholz, BSc (Simon Fraser), MSc (McMaster), PhD (Simon Fraser), NSERC University Research Fellow

Adjunct Faculty
G. A. Bakos, MA (Bratislava), MA, PhD (Toronto)
J. A. Blackburn, BSc (Manitoba), MSc, PhD (Waterloo)
W. E. Harris, BSc, (Alberta), MSc, PhD (Toronto)
J. W. Leech, BSc, PhD (London), FinstP
C. C. Lim, BA (DePauw), MA (Nebraska), PhD (Toronto)
J. Lit, BSc, DipEd (Hong Kong), DSc (Laval)
C. J. Moore, BSc, MSc, PhD (Waterloo)
L. A. A. Read, BA, MSc (McMaster), PhD (Waterloo)
G. Scoles, Dottore in Chimica (Genova), LibDoc, FCIC

Senior Demonstrators
A. B. Haner, BSc, MSc (Waterloo)
D. S. McVicar, BSc (Waterloo)

Demonstrator
C. R. Jayasundera, BSc (Waterloo)

Faculty Members of Physics holding cross appointments to:
1. Biology
2. Chemistry

Faculty Members holding cross appointments to Physics from:
3. Applied Mathematics
4. Chemistry

Faculty Members holding joint appointments with:
5. Earth Sciences
6. Chemistry

7. Faculty Member holding Adjunct Faculty Status

Course Descriptions

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 (including Coop) students in Years 2, 3, and 4, to receive information concerning the Physics Department and to hear invited speakers.

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.
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 instruments used in Kinesiology.
Prereq: PHYS 103
For Kinesiology Students
Lab alternate weeks, optional tutorial.

PHYS 111 F 3C,1T 0.5
Physics for the Life Sciences 1
An introduction to physics for students intending to concentrate their future studies in the physical sciences, optometry or mathematics; includes particle kinematics and dynamics, energy and momentum conservation, gravitational, rotational mechanics, fluid mechanics, elasticity and oscillations.

PHYS 111L F 3L 0.25
Physics for the Life Sciences 1 Laboratory
For students taking PHYS 111.
Lab alternate weeks.

PHYS 112 W 3C,1T 0.5
Physics for the Life Sciences 2
A continuation of PHYS 111; includes wave motion, normal modes of vibration, sound, hearing, temperature, heat, kinetic theory of gases, thermodynamics, electrostatic force and potential, electric current and power, DC circuits, magnetic fields and induction.
Prereq: PHYS 111

PHYS 112L W 3L 0.25
Physics for the Life Sciences 2 Laboratory
For students taking PHYS 112.
Lab alternate weeks.

PHYS 115 F 3C,2T 0.5
Mechanics
Brief review of kinematics. Particle dynamics, work, energy, conservation of energy, Conservation of linear momentum, collisions, rotational kinematics and dynamics, conservation of angular momentum. Equilibrium of rigid bodies.

For students in Year One Engineering.

PHYS 121 F 3C,2T 0.5
Introductory Physics 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: Ontario Grade 13 Mathematics; Functions and Relations, and Calculus, Ontario Grade 13 Physics recommended.
Science students must take 121L with this course.

PHYS 121L F 3L 0.25
Introductory Physics 1 Laboratory
For students taking PHYS 121.
Lab alternate weeks.

PHYS 122 W 3C,2T 0.5
Introductory Physics 2
This course is a continuation of PHYS 121; includes wave motion, gravitation, fluid mechanics, heat and thermodynamics.
Prereq: PHYS 121
Science students must take 122L with this course.

PHYS 122L W 3L 0.25
Introductory Physics 2 Laboratory
For students taking PHYS 122.
Lab alternate weeks.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>Credits</th>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 123</td>
<td>Digital Computation</td>
<td>F 3C 0.5</td>
<td>Introduction to hardware and software organization of digital computers. Features of the FORTRAN and BASIC programming languages, structured programming, algorithms applicable to the solution of problems in physics. For Co-op Physics students or students intending to major in Physics. Antireq: CS 102</td>
</tr>
<tr>
<td>PHYS 125</td>
<td>Physics for Engineers</td>
<td>W,S 3C, 2T 0.5</td>
<td>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</td>
</tr>
<tr>
<td>PHYS 222</td>
<td>Electricity and Magnetism 1</td>
<td>F 0.5</td>
<td>Coulomb’s law, electric field, Gauss’ law, potential, capacitance, properties of dielectrics, current, resistance, electromagnetic force, D.C. circuits and instruments. Prereq: First year physics and calculus Not for Honours Physics students Offered by Correspondence only in 1987-88</td>
</tr>
<tr>
<td>PHYS 223</td>
<td>Electricity and Magnetism 2</td>
<td>W 0.5</td>
<td>Magnetic fields, induced electromotive forces, magnetic properties of matter, alternating currents, electromagnetic waves. Prereq: PHYS 222 Not for Honours Physics students Offered by Correspondence only in 1987-88</td>
</tr>
<tr>
<td>PHYS 226</td>
<td>Geometrical Optics</td>
<td>F 2C, 1T 0.5</td>
<td>Reflection and refraction at plane and curved surfaces, thin and thick lenses, optical instruments. Prereq: First year physics and calculus Not for Honours Physics students Physics Majors must take PHYS 226L with this course</td>
</tr>
<tr>
<td>PHYS 226L</td>
<td>Geometrical Optics Laboratory</td>
<td>F 3L 0.25</td>
<td>For students taking PHYS 226. Lab alternate weeks.</td>
</tr>
<tr>
<td>PHYS 246</td>
<td>Physical Optics</td>
<td>W 3C, 1T 0.5</td>
<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. Prereq: First year physics and calculus Coreq: PHYS 246L</td>
</tr>
<tr>
<td>PHYS 246L</td>
<td>Physical Optics Laboratory</td>
<td>W 3L 0.25</td>
<td>For students taking PHYS 246. Lab alternate weeks</td>
</tr>
<tr>
<td>PHYS 249</td>
<td>Introduction to Waves and Diffraction</td>
<td>F,S 3C 0.5</td>
<td>Nature of light, wave motion and superposition of waves, interference, diffraction. Basic properties of laser light, monochromaticity, coherence and polarization. Theory of X-ray diffraction, X-ray methods. Space lattices, symmetry and crystal structure. Application of diffraction to physical and chemical problems including solid state structure. Prereq: First year physics Antireq: PHYS 246, PHYS 256, PHYS 259 For students in Honours Chemistry, Regular and Co-operative Applied</td>
</tr>
<tr>
<td>PHYS 249L</td>
<td>Introduction to Waves and Diffraction Laboratory</td>
<td>F,S 3L 0.25</td>
<td>For students taking PHYS 249 Lab alternate weeks</td>
</tr>
<tr>
<td>PHYS 250</td>
<td>The Solar System</td>
<td>F 3C 0.5</td>
<td>An introduction to the astronomy and astrophysics of the solar system for students with an introduction in (elementary) University Physics and Mathematics. Prereq: First year physics and calculus Antireq: PHYS 275 Offered by Correspondence only in 1987-88</td>
</tr>
<tr>
<td>PHYS 253</td>
<td>Electricity and Magnetism</td>
<td>W,S 3C 0.5</td>
<td>An introductory course in electricity and magnetism; includes Coulomb’s law, electric fields, Gauss’ law, electric potential, capacitance and dielectrics, magnetic forces and fields, inductance, magnetization, Maxwell’s equations, electromagnetic waves. Forms a basis for the understanding of most of today’s electronic and electrical technology. Prereq: First year physics and calculus, MATH 216 Physics majors must take 253L with this course. Recommended for students in Honours programs.</td>
</tr>
<tr>
<td>PHYS 253L</td>
<td>Electricity and Magnetism Laboratory</td>
<td>W,S 3L 0.25</td>
<td>For students taking PHYS 253. Lab alternate weeks.</td>
</tr>
<tr>
<td>PHYS 254</td>
<td>Thermal Physics and Properties of Matter</td>
<td>F 3C 0.5</td>
<td>An introductory course in thermal physics, kinetic theory and properties of matter; includes thermodynamics, heat engines, kinetic theory of gases, viscosity, diffusion, transport properties, elasticity. Prereq: First year physics and calculus Recommended for students in Honours programs.</td>
</tr>
<tr>
<td>PHYS 256</td>
<td>Geometrical and Physical Optics</td>
<td>F 3C 0.5</td>
<td>Electromagnetic waves and the nature of light. Geometrical optics, matrix treatment. Physical Optics: interference, Fraunhofer and Fresnel diffraction, X-ray diffraction, polarization. Optical instruments. Prereq: First year physics and calculus Physics majors must take 256L with this course. Recommended for students in Honours programs.</td>
</tr>
<tr>
<td>PHYS 256L</td>
<td>Geometrical and Physical Optics Laboratory</td>
<td>F 3L 0.25</td>
<td>For students taking PHYS 256. Lab alternate weeks.</td>
</tr>
<tr>
<td>PHYS 259</td>
<td>Crystallography and X-Ray Diffraction</td>
<td>W,S 3C 0.5</td>
<td>Space lattices, symmetry, crystal structure, crystal geometry and stereographic projections. Electronic structure of atoms and atomic bonding in solids. Theory of X-ray diffraction, X-ray methods and the reciprocal lattice. Crystal formation, crystal defects and physical properties of crystals. Prereq: First year physics and calculus Coreq: PHYS 259L</td>
</tr>
</tbody>
</table>
PHYS 259L W,S 3L 0.25
Crystallography and X-Ray Diffraction Laboratory
For students taking PHYS 259 Lab alternate weeks.

PHYS 263 W,S 3C 0.5
Classical Mechanics and Special Relativity
Newtonian dynamics and particles and systems of particles; Lagrangian dynamics and generalized coordinates; the Lorenz transformation and relativistic dynamics.
Prereq: First year physics and calculus, MATH 216

PHYS 275 F 3C 0.5
Astrophysics 1 - The Solar System
The Planets, Newtonian gravity and celestial mechanics, the formation of stars and planets, meteories, asteroids, comets, planetary interiors, planetary surfaces, planetary atmospheres, the origin of life.
Students with a weak background in Mathematics or Physics might do well to take SCI 238 first. The content and level of the core material of PHYS 275 will remain the same. Additional material will change from year to year to keep students abreast of current developments in the subject.

PHYS 301 W 3C 0.5
Physical Techniques for Biologists 1

PHYS 302 W 3C 0.5
Physical Techniques for Biologists 2
Infrared and Raman spectroscopy; nuclear magnetic and electron paramagnetic resonance spectroscopy; optical rotary dispersion and circular dichroism; X-ray diffraction, differential scanning calorimetry, flame photometry; X-ray and atomic absorption spectroscopy.
Prereq: First-year physics
Offered alternate years with PHYS 301.
Physics students may not take this course for credit.

PHYS 352 W 3C 0.5
Analog Electronics
DC and AC circuit theory; p and n materials, pn diodes, junction and FET transistors, transistor amplifiers and their equivalent circuits. Operational amplifiers. Feedback, oscillators and power supplies.
Prereq: Knowledge of determinants, elementary calculus and elementary electricity
Coreq: 352L

PHYS 352L W 3L 0.25
Analog Electronics Laboratory
For students taking PHYS 352
Lab alternate weeks.

PHYS 353 F,S 3C 0.5
Digital Electronics
Logic gates, flip-flops and shift registers. Binary numbers and Boolean algebra. An introduction to microprocessors is discussed based on the 6800. This will include arithmetic logic units, parallel input/output ports, assembly language and a number of examples.
Prereq: PHYS 122
Coreq: PHYS 353L

PHYS 353L F,S 3L 0.25
Digital Electronics Laboratory
For students taking PHYS 353
Lab alternate weeks.

PHYS 354 F,S 3C 0.5
Atomic and Molecular Physics
The Schrödinger equation applied to simple one- and three-dimensional potentials, hydrogen atoms, angular momentum and spin, molecular vibrations and rotations, many-electron atoms. Radiation processes.
Prereq: PHYS 263, MATH 213A/B
Coreq: CHEM 355

PHYS 355 F,S 3C 0.5
Thermodynamics
Thermodynamic systems, equation of state, the laws of thermodynamics with applications. Change of phase.
Prereq: PHYS 254, 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, atomic physics, solid state physics, optics and electronics.
Prereq: PHYS 263, MATH 213A/B
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 363 W 3C 0.5
Classical Mechanics
Application of the methods of classical mechanics to central-force motion, rigid body rotation, coupled oscillations and motion in non-inertial frames; survey of Hamiltonian dynamics.
Prereq: PHYS 263, second year calculus
Primarily intended for Honours Physics students.

PHYS 364 F,S 3C 0.5
Mathematical Physics 1
Vector analysis and applications. Vector operators using curvilinear coordinates. Cartesian tensors, inertia tensor, stress, strain and rate of strain tensors. Applications to elasticity, fluid, electromagnetism and relativity.
Prereq: MATH 213A/B and 216
Primarily intended for Honours Physics students.

PHYS 365 W 3C 0.5
Mathematical Physics 2
Prereq: MATH 213A/B and 216
Primarily intended for Honours Physics students.

PHYS 368 F 2C 0.5
Geophysics 1
Prereq: First year physics and calculus
Cross-listed as EARTH 368
PHYS 369 W 3C 0.5
Geophysics 2
The geology of the ocean basins. Topics in physical oceanography. Physical properties of ocean water, heat budget of the world oceans. Oceanic circulations. Coriolis effects. Some idealized current regimes.
Prereq: First year physics and calculus
Cross listed as EARTH 369

PHYS 371A F,G 3L 0.25
Intermediate Laboratory
Further experiments in atomic, nuclear and solid state physics, optics and electronics. For honours students who are taking PHYS 360A.
18 hours experiments

PHYS 371B W 3L 0.25
Intermediate Laboratory
Continuation of 371A. For honours students who are taking PHYS 360B.
18 hours experiments

PHYS 371C W 3L 0.25
Intermediate Laboratory
Microprocessor Interface Course. A Project laboratory course in which the student will interface some common microcomputers (e.g. PET, VIC20, Apple) to a variety of parallel and serial devices (e.g. terminal, D.V.M.).
Prereq: PHYS 353

PHYS 375 W 3C 0.5
Astrophysics 2 - Stellar Astronomy
Stellar spectra, spectral classification. Observational techniques, motion of stars, properties of stars, stellar distances, open clusters, globular clusters, stellar populations, gas, dust, the galactic plane, the galactic halo, galactic rotation. Statistical methods. Stellar evolution.
Prereq: PHYS 275 or consent of instructor
The content and level of the core material of PHYS 375 will remain the same. Additional material will change from year to year to keep students abreast of current developments in the subject.

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, 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 382 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, transistors, thyristors, tunnel diodes, field effect devices, optical devices, etc.
Prereq: PHYS 435

PHYS 383 F 3C 0.5
Introductory Quantum Mechanics
Prereq: PHYS 354, 364, and 365

PHYS 385 F 3C 0.5
Solid State Physics
Introductory concepts in crystal diffraction and the reciprocal lattice. Crystal bonding. Lattice vibrations, thermal properties of insulators, free-electron theory of metals, band theory. Semiconductors.
Prereq: Completion of Year Three Honours Physics

PHYS 387A F,W P 0.5
Research Project
A research project in any area of Physics approved by the course coordinators. The student is required to submit a written report and present a summary of the project orally, before the end of the term of registration.
Prereq: Completion of all third year honours physics program requirements 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. Enrollment will be limited.

PHYS 387B W P 0.5
Research Project (continued)
A continuation of the project undertaken in Physics 437A. The student is required to submit a written report and present a summary of the project by poster and/or orally before the end of the term of registration.
Prereq: Completion of Physics 437A and approval of the course coordinators

PHYS 411A/B 3C 0.5
Electromagnetic Theory
A generalized treatment of the basic laws of electricity and magnetism, mathematical techniques for the problems of electrostatics, solution of Maxwell’s equations in free space and the study of plan waves, theory of wave guides and introduction to radiation.
Prereq: PHYS 253, PHYS 364-365
No credit or grade is given for the first term course unless the two term sequence, PHYS 411A/B, is completed.

PHYS 444 F 3C 0.5
Continuum Mechanics
Prereq: PHYS 364-365

PHYS 447 W 3C 0.5
Nuclear and Particle Physics
Prereq: PHYS 455, and PHYS 434

PHYS 448 F 3C 0.5
Modern Optics
Prereq: PHYS 256 and PHYS 354
Nuclear structure, interactions of nuclear

PHYS 455 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 Mechanics
The matrix formulation of quantum mechanics. The harmonic oscillator (Heisenberg's treatment); the matrices for angular momentum. Time-independent and time-dependent perturbation theory. The interaction of atomic systems with radiation. Multiparticle systems, identical particles, Pauli exclusion principle. The helium atom.
PreReq: PHYS 434.
PHYS 454 is strongly recommended for students intending to do graduate work.

PHYS 455 F 3C 0.5
Nuclear and Particle Physics
Nuclear structure, interactions of nuclear radiations with matter, radioactive decay, nuclear reactions, nuclear force, elementary particles.
PreReq: PHYS 354.

PHYS 464 F 3C 0.5
Mathematical Physics 3
Applications to Physics of the theory of functions of a complex variable.
PreReq: PHYS 364/365

PHYS 465 W 3C 0.5
Mathematical Physics 4
Theory and applications of integral transforms, integral equations and Green's functions. Asymptotic analysis.
PreReq: PHYS 464

PHYS 475 F 3C 0.5
Astrophysics 3 - Extragalactic Astronomy
Ordinary galaxies, dynamics of galaxies, galactic haloes and disks, evolution of galaxies, peculiar galaxies, active galaxies, interacting galaxies, quasars, the Local Group, clusters of galaxies, observational cosmology, theoretical cosmology, the origin of the Universe.
PreReq: PHYS 375 or consent of instructor
The content and level of the core material of PHYS 475 will remain the same. Additional material will change from year to year to keep students abreast of current developments in the subject.

PHYS 476A-Z
Astrophysics 4 - Special Topics in Astrophysics
A lecture course offered upon demand, and upon availability of instructors in a particular branch of astrophysics.
PreReq: Consent of instructor

PHYS 480 F 3C 0.5
Radiation Biophysics
The effect of radiation of various kinds on cells and tissues; mechanisms of damage, repair theories, genetic effect, dose-response relationships; cancer radiotherapy (x-rays, electrons, neutrons, protons, negative p mesons); other types of cancer therapies used in conjunction with radiotherapy (e.g. hyperthermia); late effects of radiation; carcinogenesis; risk vs. benefit; applications.

COURSES NOT OFFERED 1987-88
PHYS 243: Electricity and Magnetism Laboratory
PHYS 243L: Electricity and Magnetism Laboratory
PHYS 251: The Stellar System Laboratory
PHYS 270: Laboratory
PHYS 271: Laboratory
PHYS 324/325: Atomic and Nuclear Physics
PHYS 442: Structure of Solids
PHYS 481: Biophysics of Organ Systems

School of Urban and Regional Planning
Professor, Director
L.O. Gertler, BA (Queens), MA (Toronto), FCIP

Associate Professor, Associate Director
L.R.G. Martin, BA (Queens), MA, MRP, PhD (Syracuse), MCIIP

Professor, Associate Dean, Graduate Studies, Faculty of Environmental Studies
G.G. Mulamootil, BSc (Mysore), MSc (Bombay), PhD (Delhi)

Associate Professor, Associate Dean, Computing and Communications, Faculty of Environmental Studies
R.T. Newirk, BA, MSc, PhD (Western Ontario)

Professor, Graduate Officer
R.C. Suffling, BSc, Hon (Wales), PhD (Queens)

Associate Professor, Undergraduate Officer
J.T. Horton, BA (Wheaton), MA (Northwestern)

Professors
S. Coblentz, BA Hon (Durham), MRP (North Carolina), FRITPI, AICP, FSS, MIES
R.S. Dorney, BSc, MSc, PhD (Wisconsin), MCIIP
D.W. Hoffman, BSA, MSA (Toronto), PhD (Waterloo) (Retired)*
K. Izumi, BArch (Manitoba), MCP (Massachusetts Institute of Technology), ARCA, FRAIC, CMACP (Retired)*
C.K. Knapper, BA Hon (Sheffield), PhD (Saskatchewan)
R.R. Krueger, BA, MA (Western Ontario), PhD (Indiana)

Associate Professors
A. E. Haight, BSc, MSc, PhD (McMaster)
S. Herzog, BArch (Toronto), MHAIC
B. Hyma, BSc, MSc (Madras), MA (Sheffield), PhD (Pittsburgh)
N.E.P. Pressman, BArch (McGill), MArch, urb des (Cornell), Cert USP (Manhosester), MCIP, AICP, AIU
G.B. Priddle, BA (Western Ontario) MA, PhD (Clark)
S.G. Rich, MCIP, MRAIC, ARIBA, AICP
J.B. Robinson, BA (Toronto), MES (York), PhD (Toronto)
W.I. Shalinsky, BA, BSW (McGill), MSc, DSW (Western Reserve)

Assistant Professors
P. Filion, BA, MA (Laval), PhD (Kent)
N.M. Lazarowich, BA (Saskatchewan), MA, MCIP, PhD (Cincinnati), AICP
B. Moore Milroy, BA (McGill), M urb. (Montreal), PhD (British Columbia)
J.E. Robinson, BSc (Waterloo), MES (York), PhD (Michigan)

Adjunct Faculty
S. Garrod, BA (McMaster), LLB, MES (York)
J.S. Wolfe, BA (Oxford), MA (Pittsburgh), PhD (London)

Planning Graphics Resource Person
K. Hammond, BBA (Guelph)

Faculty Members of Planning holding cross and/or joint appointments to:
1. Biology
2. Geography
3. Health Studies
4. Environmental Studies

Faculty Members holding cross and/or joint appointments to Planning from:
5. Anthropology
6. Environmental Studies
7. Geography
8. Environment and Resource Studies

*Also has Adjunct Appointment

Course Descriptions

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.

Prereq: 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.

Prereq: PLAN 100A, Planning students only
Estimated additional cost to student: $20

PLAN 156 F,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.

Prereq: None
(Not available for credit to planning students; Restricted to first and second year students in other programs)

PLAN 159 F,W 3std 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.

Prereq: Planning students or consent of instructor
Estimated additional cost to student: $60

PLAN 200 F 3C 0.5
The Small Group in the Planning Process
The small group and its relevance to the planning process. Focus on work groups such as committees, councils and boards. Various important elements of small groups such as leadership, goal setting, influence, decision-making and interpersonal relationships will be examined and related to planning.

Prereq: SOC 101 or consent of instructor

For planning students only.

PLAN 231 F 3C 0.5
Citizen Involvement, Planning and Social Change
The theory and practice of citizen involvement and social change in relation to planning and policy formulation. Included are the ideology of involvement, social change and intervention strategies, policy planning and local area planning. Canadian case materials are emphasized, and there is some skills training.

Prereq: SOC 101, Planning students; students from other Departments with consent of instructor

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.

Prereq: Second-year Planning students or consent of instructor

PLAN 255 W 2C, 2wkshp 0.5
Planning Surveys and Analyses
Sources of data for planning and their analyses. The course will emphasize the sources, methods of collection and analysis of urban and regional land-use data. Particular attention is paid to the types of land-use information essential to transportation, housing, public facilities and recreation planning. Both lecture and workshop are related to a significant problem of land-use planning in Ontario.

Prereq: PLAN 100 or consent of instructor
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

PLAN 256B W 2C,2std 0.5

Environmental Design 2
Continuation of PLAN 256A.
Prereq: PLAN 256A

PLAN 259 W 2C,2wkshp 0.5

Regional Planning and Development
The relationship of economic planning to regional planning. Theory and practice of regional planning and development to urban-centred, broad socio-economic, and frontier regions. A series of workshops focus upon the social and economic problems of a particular Canadian region and the role of federal, provincial and local governments in formulating and applying remedial policies in other nations.
Prereq: One of PLAN 100, 156 or consent of instructor

PLAN 270 W,S 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

PLAN 300A F 3wkshp,2flab 1.0

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,S 4std 0.5

Urban Design
A study of the design of the environment in urban and regional contexts through lectures and studio projects.
Prereq: Planning students or consent of instructor

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; profile data; data processing; 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 317 W 3C 0.5

Nonparametric Statistics
The theory and application of nonparametric statistics, with particular emphasis upon social science problems.
Prereq: ENS S 278 or consent of instructor
Cross-listed as GEOG 317
Students may receive credit for only one of PLAN 317 and GEOG 317

PLAN 318 S 3C 0.5

Spatial Analysis
Advanced quantitative analysis and sampling in a spatial context. A selection of techniques from gravity models, linear programming, nearest neighbor analysis, Markov chain analysis, graph theory, simulations, and trend surface analysis.
Prereq: ES 278
Cross-listed as GEOG 318
Students may receive credit for only one of PLAN 318 and GEOG 318

PLAN 319 F 2C,1L 0.5

Economic and Social Techniques for Regional Planning
Critical appraisal of a selection of descriptive and evaluative regional analysis techniques. Economic considerations of regional development. Reliability and applicability of data; input-output analysis; cost/benefit analysis; planning, programming and budgeting systems; and social area analysis.
Prereq: ECON 101, 102 or consent of instructor
Cross-listed as GEOG 319
Students may receive credit for only one of PLAN 319 and GEOG 319

PLAN 330 W,S 2C,1S 0.5

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 333 F 2C 0.5

The Sociology of Regional Planning
Power structures, basic social institutions, attitudes and values related to the implementation of regional plans; regional development of human natural resources in Canada and abroad.
Prereq: SOC 101 or consent of instructor

PLAN 357 F,W 4C 0.5

Conservation and Resource Management
History of the conservation movement; ecological principles of conservation and resource management. Analysis, use and planning of recreational resources. Section one of this course uses a self-directed learning approach.
Prereq: ENV S 200
Cross-listed as GEOG 357
Estimated additional cost to students: $10.
Students may receive credit for only one of PLAN 357 and GEOG 357
PLAN 300 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.

PLAN 370 F 2C 0.5
Land Development Planning
An examination of planning issues related to the economics and financing of public and private development projects including shopping plazas, residential subdivisions, and new towns. The course focuses on sources of financing, financial programming, effects of planning decisions on land values, and techniques of project evaluation.
Prereq: PLAN 255 or consent of instructor

PLAN 380 S (Oxford) 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 414 S 2C 0.5
Issues in Housing
Focus on Canadian housing policies and programs, particularly with regard to the housing of low and moderate income families. Economic, political, physical and social considerations underlying these policies will be examined in detail. Some consideration is given to housing problems and programs in the United States and developing countries.
Prereq: PLAN 259A/B or consent of instructor
Estimated additional cost to student: $20

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 "healthish" environment.
Prereq: Third and fourth-year planning students or consent of instructor

PLAN 430 F 3C 0.5
Social Policy Planning
A systems approach to change and development of change strategies by integrating social goals, plans, policies and programs. Case studies are used to measure the quality and performance of plans, policies and programs.
Prereq: PLAN 345 W 2C, 2std 0.5

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 256, 367 or consent of instructor

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 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 W 3C 0.5
Political and Administrative Processes in Urban and Regional Planning 2
Continuation of PLAN 456A.
Prereq: PLAN 456A

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 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.
Prereq: Fourth-year Planning students only

PLAN 480B 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 1.0
Senior 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 W 1.0
Senior Honours Essay 2
Completion of essay.
Prereq: PLAN 490A

COURSES NOT OFFERED 1997-98
PLAN 222 Canadian Regional Issues
PLAN 316 Multivariate Statistics
PLAN 344 Recreation Planning
PLAN 434 Planning with Native Peoples
PLAN 436 Urban Spatial Management
Department of Political Science

Assistant Professor, Chairman of the Department
T.J. Dowley, BA (Waterloo), MA, PhD (Western Ontario)

Associate Professor, Graduate Officer
A.D. Nelson, AB, AM, PhD (Chicago)

Professor, Undergraduate Officer
T.H. Quaitler, BA (New Zealand), PhD (London)

Professors
I.L. Campbell, BA (Carleton), MSc (London) R
A. Kapur, BA (Punjab), MA (George Washington), PhD (Carleton)
J.E. Kersell, BA, MA (Queen's) PhD (London)
J.M. Wilson, BA, MA (Toronto)

Associate Professor
R.J. Williams, BA, MA (McMaster), PhD (Toronto)

Assistant Professors
S.D. Burt, BA, MA (Waterloo), PhD (York)
A.F. Cooper, BA, MA (Waterloo), DPhil (Oxford)
W.B. Moul, BA, MA, PhD (British Columbia)
R.A. Nutbrown, BA (Bishop's), MA, PhD (Carleton)
J.A. Teichman, BA, MA, PhD (Toronto)
R.P. Woolstencroft, BA, PhD (Alberta)

Adjunct Faculty
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W.W. Johnston, QC, BA (Memorial), LLB (Québec)
W.J. Morrison, QC, BA (Western Ontario), LLB (Osgoode)
J.E. Surch, BA, MA (Waterloo)

Course Descriptions

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.

P SCI 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.

P SCI 101M 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.

P SCI 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:

P SCI 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.

P SCI 102E W 0.5
Political Rights and Obligations
An introductory examination of the idea of individual rights as a limitation on legitimate governmental authority, the possible grounds for such claimed rights, and their relationships to political obligations (duties).

P SCI 102F W 0.5
Politics in the Third World
This course examines worker and peasant political movements and parties in the Third World with emphasis on Latin America and Africa.

P SCI 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.

P SCI 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.

P SCI 214 2C,1T 0.5
Quantitative Analysis
An introduction to the use of quantitative methods in Political Science. Only a rudimentary understanding of mathematics is required.

P SCI 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.

P SCI 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.

P SCI 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.

P SCI 255 F,W 0.5
The Politics of Western Industrial Nations
A systematic introduction to the political processes of industrial countries. The central focus will be on Western Europe and North America. Some attention, however, will be devoted to the Antipodes, the Mediterranean countries, South Africa and Japan.
P SCI 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.
Prereq: Second-year standing

P SCI 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.
No prereq for students in the second year and above.

P SCI 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 electoral system, the party system and voting behavior.
Prereq: P SCI 260A or consent of instructor

P SCI 264 F 2C 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.
No prereq for students in the second year and above.

P SCI 268 W 2C,1T 0.5
British Government and Politics
An examination of the uniquely British characteristics of the British political system.
No prereq for students in the second year and above.

P SCI 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 critics.
No prereq for students in the second year and above.

P SCI 272 W 0.5
Political Behaviour 2
An examination of the political attitudes and behavior of men and women in different political systems.
Prereq: Second-year standing

P SCI 281 F 2C 0.5
International Politics
This course studies the transformation of the international system stressing East-West, Rich-Poor, and North-South perspectives and interactions.
No prereq for students in the second year and above.

P SCI 282 W 2C 0.5
Foreign Policy
This course studies the roots of foreign policy behavior of selected western and non-western (particularly Asian) states.
Prereq: P SCI 281 or consent of instructor

P SCI 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.
Prereq: Open to all students in the second year and above

P SCI 292 W,S 3C 0.5
Issues in Canadian 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.
Prereq: Open to all students in the second year and above

P SCI 295 F 0.5
Public Sector Management
This course examines the functions of management with major emphasis placed on employee relations, values, communication, motivation and team management.
Prereq: Second-year or consent of instructor

P SCI 315 0.5
Research Design in Political Science
Introduction to the logic and limitations of experimental and non-experimental research designs. Selected studies of politics are examined to demonstrate how plausible threats to validity are made less plausible with appropriate design and data analysis.
Prereq: P SCI 214 or consent of instructor

P SCI 321 F 2L 0.5
Marxist Theory
A basic introduction to the political and social thought of Karl Marx from the early writings to Das Capital.
Prereq: None

P SCI 322 W 2L 0.5
Marxism after Marx
A selective study of developments in Marxist theory and political movements after Marx.
Prereq: None

P SCI 323 0.5
Ancient Political Philosophy
A selective examination of political philosophy during the classical period in Greece.
Prereq: Consent of the instructor

P SCI 324 0.5
Modern Political Philosophy
A selective examination of political philosophy in the modern period.
Prereq: Consent of instructor

P SCI 331 F 2C 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.
Prereq: P SCI 260A and 260B or consent of instructor

P SCI 332 W,S 2S 0.5
Public Administration 2
Analysis of problems and issues in the field applying the knowledge gained in P SCI 331.
Prereq: P SCI 331 or consent of instructor

P SCI 333 W 0.6
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.
Prereq: P SCI 331 or consent of instructor

P SCI 342 W 2C 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.
Prereq: P SCI 280A and 280B or consent of instructor
### Course Descriptions

#### Political Science

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<tr>
<th>Course Code</th>
<th>Title</th>
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<tr>
<td>P SCI 343</td>
<td>F 2C</td>
<td>0.5&lt;br&gt;<strong>Canadian Municipal Government</strong>&lt;br&gt;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.</td>
<td><strong>0.5</strong></td>
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<tr>
<td>P SCI 344</td>
<td>W 2C.1T</td>
<td>0.5&lt;br&gt;<strong>The Politics of Local Government</strong>&lt;br&gt;A study of the political processes in selected Canadian cities focusing on citizen participation, internal decision-making, leadership, and the allocation of power. Prereq: P SCI 343 or consent of instructor.</td>
<td><strong>0.5</strong></td>
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<tr>
<td>P SCI 350A</td>
<td>F 3C</td>
<td>0.5&lt;br&gt;<strong>The Politics of the Developing Areas 1</strong>&lt;br&gt;An introduction to the politics of Asia, Africa and Latin America focusing upon the political roots of poverty in the developing areas. Topics include the impact of world trade, colonization, multinationals and foreign aid. No prereq for students in the third year and above.</td>
<td><strong>0.5</strong></td>
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<tr>
<td>P SCI 350B</td>
<td>W 3C</td>
<td>0.5&lt;br&gt;<strong>The Politics of the Developing Areas 2</strong>&lt;br&gt;An examination of the politics of the developing areas with emphasis on the political behaviour of peasants, the urban poor, organized labour, and the military. No prereq for students in the third year and above.</td>
<td><strong>0.5</strong></td>
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<tr>
<td>P SCI 351</td>
<td>F 2S</td>
<td>0.5&lt;br&gt;<strong>Federal and Consociational Political Systems</strong>&lt;br&gt;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. Prereq: Consent of the instructor.</td>
<td><strong>0.5</strong></td>
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<tr>
<td>P SCI 352</td>
<td>F 0.5&lt;br&gt;<strong>Canadian Constitutional Law</strong>&lt;br&gt;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. Prereq: P SCI 260A and 260B or 260A and consent of instructor.</td>
<td><strong>0.5</strong></td>
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<tr>
<td>P SCI 356</td>
<td>F 0.5&lt;br&gt;<strong>Chinese Politics</strong>&lt;br&gt;An analysis of the historical development, contemporary politics and future directions of the People's Republic of China emphasizing the role of ideology, political institutions, citizen participation and policy-making in selected areas. Prereq: Third year standing and consent of instructor.</td>
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<tr>
<td>P SCI 372</td>
<td>W 0.5&lt;br&gt;<strong>Political Parties and Interest Groups</strong>&lt;br&gt;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. Prereq: Third-year standing or consent of instructor.</td>
<td><strong>0.5</strong></td>
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<tr>
<td>P SCI 375</td>
<td>W 0.5&lt;br&gt;<strong>The Politics of Self-Management</strong>&lt;br&gt;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.</td>
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<tr>
<td>P SCI 380A</td>
<td>F 0.5&lt;br&gt;<strong>World Politics 1</strong>&lt;br&gt;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.</td>
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<tr>
<td>P SCI 380B</td>
<td>W 0.5&lt;br&gt;<strong>World Politics 2</strong>&lt;br&gt;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.</td>
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<tr>
<td>P SCI 381</td>
<td>W 0.5&lt;br&gt;<strong>Foreign Policies of South Asian States</strong>&lt;br&gt;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. Prereq: P SCI 260A and 260B and consent of instructor.</td>
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<tr>
<td>P SCI 390-398</td>
<td>0.5&lt;br&gt;<strong>Special Studies</strong>&lt;br&gt;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.</td>
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<td>P SCI 422</td>
<td>0.5&lt;br&gt;<strong>Conflict of Political Ideas in Canada</strong>&lt;br&gt;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.</td>
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<td>P SCI 426</td>
<td>0.5&lt;br&gt;<strong>Selected Subjects in Political Philosophy</strong>&lt;br&gt;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 P SCI 225, 226, 323, or 324, or consent of instructor.</td>
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<tr>
<td>P SCI 427</td>
<td>F 0.5&lt;br&gt;<strong>Special Topics in Political Philosophy</strong>&lt;br&gt;A selective examination of basic problems in political philosophy in the modern and pre-modern periods. Prereq: P SCI 225, 226, 323, or 324.</td>
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<tr>
<td>P SCI 428</td>
<td>F 3S</td>
<td>0.5&lt;br&gt;<strong>State and Economic Life</strong>&lt;br&gt;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.</td>
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<tr>
<td>P SCI 431</td>
<td>F 0.5&lt;br&gt;<strong>Canadian Public Policy</strong>&lt;br&gt;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: P SCI 260A and 260B and consent of instructor.</td>
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P SCI 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 focusing 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

P SCI 436 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

P SCI 437 W 3S 0.5
The Politics of International Resources
An examination of the politics of international resources. Attention will be given to the set of issues relating to minerals, water, oceanic fisheries, oil energy, timber and labour.
Prereq: Consent of the instructor

P SCI 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: P SCI 260A and 260B or 341 or consent of the instructor

P SCI 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: P SCI 260 or 341 or consent of instructor

P SCI 451 W 3S 0.5
Comparative Communist Systems
This course, which will focus on the Soviet Union, China and Cuba (with reference to Yugoslavia), will familiarize students with the differences and similarities that exist among communist countries.
Prereq: Third-year standing and consent of instructor

P SCI 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

P SCI 454 W 3S 0.5
Comparative Politics
Selected topics in the politics of the Third World.
Prereq: Fourth-year standing or consent of instructor

P SCI 461 F 2C,15 0.5
Problems in Canadian Politics 1
Selected aspects of Canadian national politics.
Prereq: Fourth-year standing or consent of instructor

P SCI 462 W 0.5
Problems in Canadian Politics 2
Selected aspects of Canadian provincial politics.
Prereq: Fourth-year standing or consent of instructor

P SCI 471 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

P SCI 473 2S 0.5
Voting Behaviour
Prereq: P SCI 214, 373 or consent of instructor

P SCI 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

P SCI 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

P SCI 481 2S 0.5
Senior Research Seminar: Violence in the Political Process
An examination of research on the causes and consequences of interstate warfare.
Prereq: P SCI 380 or consent of instructor

P SCI 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

P SCI 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: Fourth-year standing or consent of instructor

P SCI 490-499 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.
Department of Psychology

Professor, Chairman of the Department
P.M. Merkile, BA (Knox), MA, PhD (Virginia)

Professor, Dean of the Faculty of Arts
R.K. Banks, BA, MA, PhD (Toronto)

Associate Professor, Associate Dean for Undergraduate Affairs and Computing, Faculty of Arts
G.A. Griffin, BA (Colgate), MA, PhD (Wisconsin), Recipient of the Distinguished Teacher Award

Professor, Deputy Chairman
M.P. Zanna, BA, PhD (Yale)

Professor, Associate Chairman, Graduate Affairs
M.D. Vogel-Spratt, BA (McMaster), MA, PhD (Toronto)

Professor, Associate Chairman, Undergraduate Affairs
H. Ross, BA (Toronto), PhD (North Carolina)

Professors
K.S. Bowers, BA, PhD (Illinois)
M.P. Bryden, BS (MIT), MSc, PhD (McGill)
W.C. Corning, BA (Heidelberg), PhD (Rochester)
D.P. Crowne, BA (Antioch College) EdM (Rochester), PhD (Purdue)
J.A. Dyal, BA (Oklahoma), PhD (Illinois)
C.K. Knapper,² BA (Sheffield), PhD (Saskatchewan)
H.M. Letcourt, BA (Antioch College), MA, PhD (Ohio State)
M.J. Lerner, BA, MA (Ohio State), PhD (New York)
R.G. Martenik,² BPE, MA (Alberta), EdD (California)
D. Meichenbaum, AB (City College of New York), MA, PhD (Illinois)
S. Reins, MD, SCs (Charles)
M.A. Ross, BA (Toronto), MA, PhD (North Carolina)
R.M. Rowe, BA (Toronto), MS, PhD (Rochester)
T.G. Waller, MS, MS (Southern Mississippi), PhD (Vanderbilt)

Associate Professors
R.J. Alapack, BA (Scranton), MA, PhD (Duquesne), J
D.M. Amorosó, BA, MA (Toronto), PhD (Waterloo)
J.M. Anglin, BA (Toronto), PhD (Harvard)
P.E. Bowers, BA (Queen's), MA, PhD (Illinois)
T.E. Cadell, BA (British Columbia), MA (Massachusetts), PhD (Wisconsin)
A.J.R. Cameron,⁶ BA, MA, PhD (Waterloo)
N. Charness,² BA (McGill), MS, PhD (Carnegie-Mellon)
J.A. Cheyne, BA (Waterloo Lutheran), MA, PhD (Waterloo)
J.M. Cornell, BA, MS, PhD (Washington)
J.G. Holmes, BA, MA (Carleton), PhD (North Carolina)
R.H. Lahue, BSc (Fordham), PhD (Waterloo)
R.G. MacKinnon, BA (Queen's), PhD (John Hopkins)
P.J. Nauss, BA, PhD (Nijmegen), J
J.E. Orlando, BA (Western Ontario), MA (Detroit), MA, PhD (Michigan), J
R.D. Seim,¹ BA (Queen's), PhD (Waterloo)
J. Theis, BA (Western Ontario), MA (Notre Dame), PhD (Washington)
J.A. Van Evra, BA (Valparaiso), MA (Bowling Green), PhD (Michigan State), J

P.E. Wainwright,⁶ BSc (Rhodes), MA, PhD (Waterloo)
E.E. Ware, BA, MA (Richmond), PhD (Illinois)

Assistant Professors
D. Besner, BA (Loyola College), MSc (Memorial), PhD (McGill)
M. Moretti, BA (Brock), MA, PhD (Simon Fraser)
E.Z. Woddy, MA (Reed), MS (Oxford), PhD (Duke)

Adjunct Faculty
J.R. Amurow, BS (Montreal State), MA, PhD (Denver)
D.S. Barnes, BA, MD (Western Ontario)
R.J. Dart, BS (Washington), MA, PhD (Waterloo)
B.S. Francis, BS (Ursinus), MA, PhD (Arizona)
J.J. Hartford, MD (Toronto)
S.P. Lollis, BSc, MSc (California), PhD (Waterloo)
C.B. Lowry, BA (McGill), MA, PhD (Mississippi)
R.F. Mann, MA, MSC, PhD (Waterloo)
S.L.S. Quan, BA (Waterloo), BSc (Western Ontario), MSC (Guelph)
G. Summer-Smith, MRCVS, BSc (Liverpool), FRCVS, BSc (Guelph)
J.L. Williams BA, MA (Alberta), PhD (Missouri)

Faculty Members of Psychology holding cross appointments to:
¹Optometry
²Kinesiology
³Environmental Studies
⁴Kinesiology
⁵Statistics
⁶Health Studies

Faculty Members holding cross appointments to Psychology from:

Professor, Associate Dean for Undergraduate Affairs and Computing, Faculty of Arts
G.A. Griffin, BA (Colgate), MA, PhD (Wisconsin), Recipient of the Distinguished Teacher Award

Faculty Members holding cross appointments to Psychology from:
³Environmental Studies
⁴Kinesiology
⁵Statistics
⁶Health Studies

J refers to faculty members at St. Jerome's College

R refers to faculty members at Renison College

COURSES NOT OFFERED 1987-88

PSCI 102C - Politics in Action
PSCI 253 - Comparative Communism 1
PSCI 254 - Comparative Communism 2
PSCI 312 - Approaches to Survey Analysis in Political Science
PSCI 341 - Provincial Politics
PSCI 352 - Comparative Legislative Systems
PSCI 362 - Soviet Government and Politics
PSCI 375 - The Politics of Self-Management
PSCI 424 - Contemporary Socialist and Communist Thought
PSCI 433 - Public Policy and Underdevelopment in the Third World
PSCI 476 - Research Seminar in Political Behaviour

Descriptions of Courses:
PSCI 254 - Comparative Communism 1
PSCI 253 - Comparative Communism 2
PSCI 352 - Comparative Legislative Systems
PSCI 362 - Soviet Government and Politics
PSCI 375 - The Politics of Self-Management
PSCI 424 - Contemporary Socialist and Communist Thought
PSCI 433 - Public Policy and Underdevelopment in the Third World
PSCI 476 - Research Seminar in Political Behaviour

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.
Course Descriptions

Introductory Note
See departmental course listing catalogue for specific terms of the various course offerings in 1987-88.

PSYCH 101 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.

PSYCH 102
Introductory Psychology Special Topics
An in-depth study of selected broad issues and problems introduced in PSYCH 101.

PSYCH 102A 3C 0.5
Applied Psychology
Applications of Psychological research to contemporary concerns: personnel selection, training and evaluation, management and organizations, human factors engineering, man and environment, consumer behaviour, clinical, counselling and community psychology.

PSYCH 102B 3C 0.5
Nature, Nurture and Human Behaviour
The role of heredity and environment in the development of intelligence, mental disorders, and criminal behaviour.

PSYCH 102C 3C 0.5
Culture's Influence on Behaviour
The role of culture on the development of Perception, Cognition, Learning and Memory; cultural influences on personality and personality disorders, and on conflict and aggression.

PSYCH 102D 3C 0.5
Psychology of Consciousness
Modes of thinking, emotion, creativity, and altered states of consciousness.

PSYCH 102E 3C 0.5
Psychological Intervention
Applications of Psychology to human coping problems and growth with emphasis on analyzing critically current treatment methods.

PSYCH 102F 3C 0.5
Personal Adjustment
Focus on research which investigates the everyday task of coping with ourselves, our environment, and the people we encounter. Topics will focus on the themes of knowing the self, interpersonal relationships, and of the way in which our social and physical environment affects our behaviour.

PSYCH 102G 3C 0.5
Introduction to Neuroscience
The relation between brain as a substrate and mind as a process is an important scientific and philosophical problem. In this course, those biological aspects of brain function will be discussed which are directly related to the functioning of the human mind.

PSYCH 102H 3C 0.5
Psychology and the Nuclear Threat
The course will examine the ways in which psychological concepts and theory can be applied to understanding our reactions to nuclear threat and to improving international relations.

PSYCH 200 3C, 1L 0.5
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.

PSYCH 203 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.

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.

PSYCH 207 3C 0.5
Cognitive Processes
An examination and evaluation of selected topics dealing with human learning, thinking, concept formation, memory and language.

PSYCH 211 3C 0.5
Developmental Psychology
An examination of the process and factors of human development.

PSYCH 212 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.

PSYCH 213 3C 0.5
Exceptional Children
Educational problems associated with mental retardation, emotional disturbances, sensory and physical impairments and intellectual giftedness.

PSYCH 214 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.

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.

PSYCH 218 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 the life of man. Therapy with dying individuals is reviewed and evaluated.

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  3C  0.5
A Psychological Analysis of Human Sexuality,
This course will examine psychological and social psychological theories and empirical investigations of human sexuality.
Prereq: PSYCH 101 or permission of instructor
Offered at St. Jerome's College.

PSYCH 253  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
Cross-listed as PSYCH 220R

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 258  3C  0.5
Principles and Evolution of Psychoanalytic Thought
This course expresses the fundamental psychoanalytic vision as articulated by Sigmund Freud, and its relevance to the humanities. The theme is to understand the potentially liberating spirit which is at the root of psychoanalysis.
Prereq: PSYCH 101
Offered at St. Jerome's College.

PSYCH 261  3C  0.5
Physiological Psychology
Introduction to brain, basic physiological processes, and their roles in behaviour. Course covers sensing and perceiving; neural bases of action; motivation; learning and memory; and consciousness. Both empirical and clinical data are considered.
Prereq: PSYCH 101 or permission of instructor

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

PSYCH 291  3C  1.5
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
Students may receive credit for only one of PSYCH 291 and REC 270A

PSYCH 292  3C  1.5
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 6) on page 8.7.

PSYCH 305  2C,2L  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
Cognitive Neurology
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 205, 207, 261, or KIN 256

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  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
Also offered at St. Jerome's College.
Students may receive credit for only one of PSYCH 180 or PSYCH 312

PSYCH 314  3C  0.5
Perspectives in Mental Health
The course is designed to introduce students to the mental health sciences and to the ways in which knowledge of the sciences has been applied to understanding and treating human illness.
Prereq: PSYCH 101 or permission of instructor

PSYCH 315  3C  0.5
Survey of Mechanisms Development and Abnormalities
An introduction to the biological, psychological and social aspects of human development and the origins of abnormality.
Prereq: PSYCH 101

PSYCH 316  3C  0.5
Research Methods and Statistics
An introduction to experimental design in psychological research. Emphasis on methods of observing behaviour and the procedures used to summarize these observations are emphasized.
Prereq: PSYCH 101 and second year Honours standing in Psychology
Students may receive credit for only one of PSYCH 291 and REC 270A

PSYCH 317  3C  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
Students may receive credit for only one of PSYCH 291 and REC 270A

PSYCH 318  3C  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 6) on page 8.7.
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 101

PSYCH 316 3C 0.5
Moral Development
A consideration of psychological theory and research dealing with the nature and origin of moral development, developmental differences in moral judgement, and various approaches to teaching moral behaviour with its consequent effects on the individual.
Prereq: PSYCH 211

PSYCH 317 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.

PSYCH 322A/B F.W 0.5/0.5
Principles and Practice in Early Childhood Education 1
Current principles of teaching preschool-aged children. An emphasis is placed on those curricula which aim to foster social and cognitive development. Topics include: characteristics and needs of children in group-care settings; classroom management; curriculum planning.
Prereq: Acceptance into the Early Childhood Education and Care Option

PSYCH 322A/B F.W 25/25
Practicum in Early Childhood Education 1
Directed supervision with young children in group settings. This course a total of 200 hours of fieldwork in preschool, daycare, and kindergarten settings over two terms. The time will be distributed between regular weekly responsibilities and block placements of full-time work. Must be taken concurrently with PSYCH 322A/B.
Prereq: Acceptance into the Early Childhood Education and Care Option
Pass/Fail Grading

PSYCH 325A/B F.W 0.5/0.5
Practicum in Early Childhood Education A
Directed supervision with young children in group settings. These courses require a total of 200 hours of field work in preschool, daycare and kindergarten settings over two terms. The time will be distributed between regular weekly responsibilities and block placements of full-time work. Must be taken concurrently with PSYCH 325A/B.
Prereq: Acceptance into the Early Childhood Education and Care Option
Pass/Fail Grading

PSYCH 333 3C 0.5
Industrial/Organizational Psychology
An introduction to the methods and problems in Industrial Psychology.
Prereq: PSYCH 101

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

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 333

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 to research in early education.
Prereq: PSYCH 211

PSYCH 344 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 353 3C 0.5
Aggression and Social Conflict
This course will examine the genetic, physiological, and social causes of aggression, with the emphasis on social-psychological causes.
Prereq: PSYCH 253

PSYCH 354 3C 0.5
Interpersonal Processes in Critical Situations
The course will examine reactions to victims of misfortunes such as serious physical and mental illness, natural disaster, poverty and discrimination.
Prereq: PSYCH 253
An examination of the various aspects of planning and administration in early childhood education programs. Topics include: Practical applications of Piaget's theory; parent education.

Prereq: PSYCH 322A or 323A/B or 325A/B

Research in Social Psychology
Open only to students in a Psychology Honours Program.
Prereq: PSYCH 253 and 391 (acceptable as a corequisite)

PSYCH 396 2C,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 2C,3L 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 396 2C,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 410 3C 0.5
History and Systems
An examination of current theoretical approaches to psychological problems presented in an historical context.

PSYCH 422A/B F.W 0.5/0.5
Principles and Practice in Early Childhood Education II
An examination of the various aspects of planning and administration in early childhood education programs. Topics include: Practical applications of Piaget's theory; parent education.
Prereq: PSYCH 322A or 323A/B or 325A/B

A letter grade for PSYCH 422A will be submitted only after the completion of PSYCH 422B

PSYCH 423A/B F.W 25/25
Practicum in Early Childhood Education II
Practicum for advanced students in early childhood education. These courses require a total of 300 hours of fieldwork in preschool, daycare, and kindergarten settings over two terms. The time will be distributed between regular weekly responsibilities and block placements of full-time work. Must be taken concurrently with PSYCH 422A/B.
Prereq: PSYCH 322A/B and 323A/B

Pass/Fail Grading
A grade for PSYCH 423A will be submitted only after the completion of PSYCH 423B
PSYCH 425A/B F.W 1.0/1.0
Practicum in Early Childhood Education B
Practicum for advanced students in early childhood education. These courses require a total of 400 hours of fieldwork in preschool, daycare, and kindergarten settings over two terms. The time will be distributed between regular weekly responsibilities and block placements of full-time work. Must be taken concurrently with PSYCH 425A/B.
Pre: PSYCH 322A/B and 325A/B, Pass/Fail grading.
A grade for PSYCH 425A will be submitted only after the completion of PSYCH 425B.

PSYCH 440A/B F.W 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.
Pre: 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.

HONOURS SEMINARS
Departmental listing of seminar offerings for 1987-88 should be consulted.

PSYCH 451 2S 0.5
Senior Honours Seminar in Learning
Admission by consent of instructor.

PSYCH 452 2S 0.5
Senior Honours Seminar in Perception
Admission by consent of instructor.

PSYCH 453 2S 0.5
Senior Honours Seminar in Developmental Psychology
Admission by consent of instructor.

PSYCH 454 2S 0.5
Senior Honours Seminar in Educational Psychology
Admission by consent of instructor.

PSYCH 455 2S 0.5
Senior Honours Seminar in Social Psychology
Admission by consent of instructor.

PSYCH 456 2S 0.5
Senior Honours Seminar in Personality
Admission by consent of instructor.

PSYCH 457 2S 0.5
Senior Honours Seminar in Clinical Psychology
Admission by consent of instructor.
Also offered at St. Jerome’s College

PSYCH 458 2S 0.5
Senior Honours Seminar in Cognitive Processes
Admission by consent of instructor.

PSYCH 459 2S 0.5
Senior Honours Seminar in Motivation
Admission by consent of instructor.

PSYCH 461 2S 0.5
Senior Honours Seminar in Physiological Psychology
Admission by consent of instructor.

PSYCH 462 2S 0.5
Senior Honours Seminar in Animal Behaviour
Admission by consent of instructor.

PSYCH 463 (A-Z) - 466 (A-Z) 2S 0.5
Senior Honours Seminar in Special Topics
One or more term seminars will be offered at different times as announced by the Department.
Admission by consent of instructor.

PSYCH 490A/B F.W,3 R 0.5/0.5
Directed Studies in Special Topics
For the student who desires to pursue a particular topic in depth through independent experimental research and/or extensive reading. A faculty member must approve a student’s project prior to registration for this course. Open to exceptional students with permission of the instructor and the Department.

PSYCH 499A/B 0.5/0.5
Senior 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.
Open to fourth-year Honours Psychology or Make-Up Psychology students only
A letter grade for PSYCH 499A will be submitted only after the completion of PSYCH 499B.

The following courses are administered by Henson College. Since these courses are intended primarily for students in the Social Development Studies program,
Department of Recreation and Leisure Studies

Associate Professor, Chairman of the Department
S.L.J. Smith, BA (Wright State), MA (Ohio State), PhD (Texas A&M)

Associate Professor, Associate Dean, Undergraduate Affairs, Faculty of Human Kinetics and Leisure Studies
D. Ng, BA (Lingnan), MA (Carver), MS, ReD (Indiana)

Professor, Associate Dean for Computing and Special Projects, Faculty of Human Kinetics and Leisure Studies
E.M. Avedon, BSS (William and Mary), MA, EdD (Columbia)

Assistant Professor, Associate Chairman, Graduate Affairs
W. Frisby, BPE (Alberta), MHK (Windsor), PhD (Waterloo)

Assistant Professor, Associate Chairman, Undergraduate Affairs
L. Heywood, BA (North Dakota), MA (Florida State), PhD (Wisconsin)

Professors
W.R. Forbes, BSc, PhD, DSc (London), DIC, ARCS
B.D. McPherson, BA, MA (Western Ontario), PhD (Wisconsin)
G. Wall, BA (Leeds), MA (Toronto), PhD (Hull)
J. Zuzanek, CSc (Prague Institute of Sociology), PhD (Charles University, Prague)

Associate Professor
R.C. Mannell, BA (McMaster), MPE, PhD (Windsor)

Assistant Professors
L. Caldwell, BS (Pennsylvania State), MS (North Carolina State), PhD (Maryland)
P. Eagles, BSc (Waterloo), MSc (Guelph), PhD (Waterloo), MCP
D. Getz, BES (Waterloo), MA (Carleton), PhD (Edinburgh)
R.D. Graham, BA, MA (Western)
R. Johnson, BA, MA (Windsor), PhD (Minnesota)

Lecturers
A. Gilbert, BA, MA (Waterloo)
B. Smale, BA, MA (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:

3. Kinesiology
4. Statistics and Actuarial Science
5. Geography

Course Descriptions

Courses not offered in the current academic year are listed at the end of this section.

REC 100 F 3C 0.5
Introduction to the Study of Leisure and Recreation and Leisure Services
An overview of the field of recreation emphasizing the understanding of leisure phenomena as well as an introduction to various leisure service resources.

REC 200 F 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.

REC 201 F 3C 0.5
Leisure and the Social Sciences
Examination of modern methodological and theoretical approaches to the study of leisure behaviour with emphasis upon the socio-cultural, socio-psychological and economic dimensions.

REC 203 W 3C 0.5
An Introduction to the Sociology of Sport
An introduction to the characteristics, processes and problems of sport as a social system. In addition, the social psychological aspects of sport involvement are considered.

REC 204 F, S 3C 0.5
Leisure and Recreation in Historical Perspective
Analysis of socio-cultural determinants which have influenced Canadian Leisure behaviour.

REC 210 F 3C 0.5
Organization and Administration of Recreation Services
The organization and administration of recreation on federal, provincial and municipal levels; legislation; financing, budgeting, problem solving, public relations, administrative practices and departmental organization with particular emphasis on the municipal level.

REC 220 F 3C 0.5
Program Management in Leisure Services
A study of the scope of recreation programs and the factors involved in program management. Emphasis will be placed on the goals in recreation for the leader and participant, effective leadership of individuals and groups, individual and group creativity.

REC 230 W 3C 0.5
Introduction to Outdoor Recreation
A study of outdoor recreation in relation to contemporary lifestyles, natural and human resource systems. Includes the examination of outdoor settings as an integral part of an outdoor recreation continuum. Includes the role of selected governmental and non-governmental bodies.

REC 244 F 3C 3L 0.5
Administration of Camping and Outdoor Education
The philosophy and objectives of camping and outdoor education; administration, organizing, planning, staff, relationships, leadership training, trends in camping and outdoor education. The emphasis in this course will be the place of the resident camp in education and recreation.

Prerequisites: REC 230

REC 250 W 3C 0.5
Introduction to Recreation for Special Populations
Examines the philosophical, theoretical and empirical frameworks of recreation as a therapeutic service and process to individuals with physical, emotional and intellectual disabilities.

REC 270A F,W 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.
REC 300 F 3C 0.5  
**Philosophy of Leisure**  
Examination of major philosophical themes through the ages with reference to contemporary viability and effect upon social behaviour.  
*Prereq: Consent of instructor, third year standing*

REC 301 W 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*

REC 302 F 3C,1L 0.5  
**Travel and Tourism**  
The scope and nature of travel and tourism as contemporary leisure experiences. Economic, political and social ramifications, research strategies employed, implications for the future.

REC 304 S 3C 0.5  
**Community and Cultural Development**  
A study of major issues of Canadian cultural policy from a socio-historical, political and sociological perspective. Students will examine the role and organizational structure of the arts and major cultural agencies, and discuss social, economic and administrative aspects of professional, amateur, commercial and public art organizations and services.  
*Prereq: REC 301 or 305 or consent of instructor*

REC 305 F 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*

REC 307 W,S 2C,1T 0.5  
**Social Psychology and Physical Activity**  
An examination of sport and other forms of physical activities as social situations. Topics such as social facilitation, modelling, person perception, expectancies, group structure, unity, motivation, leadership, conformity, and intergroup relations are introduced in relation to motor performance.  
*Prereq: PSYCH 101  
Cross-listed as KIN 354*

REC 310 S 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 and BUS 121, or consent of instructor*

REC 311 S 3C 0.5  
**School Recreation**  
An analysis of the relationships between recreation and education with particular emphasis on the sponsoring of community recreation programs by education authorities including leisure education and co-curriculum activities.  
*Prereq: REC 210*

REC 312 W 3C 0.5  
**Recreation and Community Action**  
The role of the citizen in recreation systems with regard to social change. Students will examine models for social change which interact with recreation systems and power relationships between citizen's groups and recreation systems.  
*Prereq: REC 210*

REC 317 S 2C,3L 0.5  
**Introduction to Museum Management**  
Overview of organization and structure of federal, provincial, and local Canadian heritage institutions, e.g., museums, art galleries, historic sites, and parks, etc. Examination of staff-personnel functions with respect to policy and program, income and expenditure, micro-environmental issues, computerized information holdings, etc. Laboratory work and field trips.  
*Prereq: introductory management course, or consent of the instructor*

REC 320 F,W 2C,2L 0.5  
**Evaluation of Recreational Programs**  
Evaluation procedures and techniques applicable to recreation programs are examined in detail. Specification of objectives, development of practical recording procedures and experimental analysis are stressed. Students conduct field evaluations in local community agencies.  
*Prereq: REC 270A*

REC 321-329 0.5  
**Selected Topics in Recreation and Leisure Studies**

REC 321 W 3C 0.5  
**Recreation and Tourism Analysis**  
Descriptive quantitative indices for tourism and recreation development, trend extrapolation, forecasting, market evaluation. Emphasis is on applications of quantitative methods.  
*Prereq: REC 371A*

REC 322 F 3C 0.5  
**Technology and Leisure**  
Socio-political, and economic impacts of contemporary technology upon the leisure service industry; impacts upon leisure behaviour: moral and ethical issues generated by these impacts.  
*Prereq: Senior Students*

REC 323 S 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*

REC 323A F 3C 0.5  
**Advanced Seminar in Leisure Service Management**  
This course is designed to explore and examine problems and issues associated with the delivery models, and administration of services are covered.  
*Prereq: Senior Therapeutic Students or consent of the instructor*

REC 325A W 3C 0.5  
**Applying Behavioural Science to Leisure Problems and Issues**  
A general examination of how social psychological methods, theories and findings are being applied to the solutions of social problems and the planning of improved arrangements for work, home life and recreation. Major emphasis will be given the identification of applied leisure-related problems and the development of behavioural science strategies for solving these.  
*Prereq: Recreation 270A, 371A and 301 or 305, or consent of instructor*

REC 327A S 3C 0.5  
**Leisure and Mass Media**  
Analysis of social effects of mass media as a form of leisure. The role of mass media in the daily lives, leisure and consumer behaviour of Canadians.  
*Prereq: Recreation 300 or 301 or 305*
The present status of outdoor education in modern society; government functions and policies related to outdoor education services; the planning and administration of outdoor education activities. Current problems.

Prereq: REC 230

Rec 332: S 2C,2L 0.5

Applied Methods in Outdoor Recreation

Emphasis on methods and techniques for the selection, development, and implementation of programs and projects through the utilization of diverse and unique natural settings and environments.

Prereq: REC 230

Rec 333: W 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 behavioral aspects of amenity resources.

Cross-listed as GEOG 333

Rec 334: F 3C,1L 0.5

Park Management

Park administrative procedures in park management. Operational techniques are examined together with general policies of acquisition, operation and development.

Prereq: REC 230

Cross-listed as ENV S 334

Rec 352: W 3C 0.5

Recreation and Mental Retardation

An analysis of the motoric and psychosocial behavioral dimensions specific to the retarded with direct and obvious applicability to the planning, implementing and evaluating of recreational programs.

Prereq: REC 250, PSYCH 312

Rec 353: F 3C 0.5

Recreation and Physical Disabilities

The psycho-social aspects of physical disabilities will be analyzed, with special focus given to the planning, implementing and evaluating of leisure activities.

Prereq: REC 250, permission of instructor

Rec 364: W 3C 0.5

Recreation and Mental Health

A psycho-social analysis of the determinants and consequences of recreational behaviour as related to positive and negative mental health, discussing in detail, structure, semiotic factors and interaction patterns.

Prereq: REC 250

Rec 361: W 3C 0.5

Aging and Leisure

Social parameters of the aging process with particular reference to the Leisure Service Industry.

Prereq: Third-year standing or consent of instructor

Rec 370: F,W,S 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. May be repeated once in a subsequent term.

Prereq: Faculty approval

Rec 371A: F 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.

Rec 372: W 2C,2L 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: A one term statistics course and computer literacy (e.g. CS100 or high school computing)

Cross-listed as CS 316

Rec 401: W 3C 0.5

The Economics of Recreation

A critical examination of the applications of market and non-market segmentation, valuation, and related concepts to recreation and leisure. Course content is based on recent research methods and findings from the field of leisure studies.

Prereq: Third-year standing and ECON 101 or permission from instructor

Rec 402: F 3C 0.5

Colloquium on Religion and Leisure

Theological notions as they relate to theories of leisure. Contemporary trends and behavior which affect organized religion and other leisure-related institutions.

Rec 406: S 0.5/0.5

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 410: W 3C,1L 0.5

Planning of Recreation Facilities

A course to introduce the students to the planning, design and layout of recreation areas and facilities.

Prereq: REC 210 or 332 or consent of instructor

Rec 416: F 3C,1L 0.5

Principles of Recreation Planning

An exploration of alternative approaches to the planning of recreation opportunities. The demand for and supply of recreation opportunities; standards, models and systems; recreation planning policies and agencies; and selected recreation planning issues.

Prereq: PLAN 156 or 332 or a full credit in Geography, or consent of instructor

Rec 425: F 3C,1L 0.5

Marine Recreation

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 conflict resolution.

Prereq: REC 334 or equivalent

Rec 426: W 3C 0.5

Tourism Planning, Development and Marketing

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: Recreation 302

Rec 429: F,S 2C,2L 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: Fourth-year standing or consent of instructor
An independent research project on an approved topic supervised by a faculty member. Required of all students enrolled in the Honours Recreation and Leisure Studies program.

Prereq: REC 332 or consent of instructor

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 publics and indigenous people in the design and management of natural areas will be studied.

Prereq: REC 334/ENV 334
Cross-listed as ENV S 433

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 100 and REC 230 or consent of instructor

Research 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 432 W 3C, 1L 0.5 Interpretation
Concepts, philosophy and practices of interpretation related to the use of cultural and natural heritage resources.

Prereq: REC 332 or consent of instructor

Directed Study in Special Topics
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. May be repeated once in a subsequent term.

Prereq: Faculty approval

Course Descriptions
Rec 475 F, W, S 0.5 Directed Study in Special Topics
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. May be repeated once in a subsequent term.

Prereq: Faculty approval

COURSES NOT OFFERED 1987-88

REC 201 Leisure and the Social Sciences
REC 241 Administration of Camping and Outdoor Education
REC 311 School Recreation
REC 312 Recreation and Community Action
REC 406 Comparative Recreational Systems
REC 434 Advanced Park Planning and Management
REC 435 Recreation and Resource Policy

Department of Religious Studies

Associate Professor and Chairperson
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. Klaassen, BA (McMaster), BD (McMaster Divinity School), PhD (Oxford) G

Associate Professors
W.J. Bildstein, BA (Western Ontario), STB (Gregorian), MA (Windsor), STD (Angelicum) J
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 (College St. Dominique, France), R. STM (McGill), PhD (Hartford Seminary Foundation) P
R.D. Legge, BA (Transylvania), STB (Harvard), PhD (McMaster) P
M. Malone, BA (University College, Dublin, Ireland), BEd (Victoria University of Manchester School of Education), MA, PhD (University of Toronto) J
J.W. Miller, BA (Goshen), MA (New York), BD (Princeton), ThD (Basel) G
D.J. Sahas, BA (Athens), STM (Christian Theological Seminary), PhD (Hartford Seminary Foundation)
R.J. Sawatsky, BA (Belhel, Kansas), MA (Minnesota), MA, PhD (Princeton) G

Assistant Professors
M. Higgins, BA (St. Francis Xavier), MA, PhD (York), J
M. Kiley, BA (Boston), STM, PhD (Harvard) J
A.J. Reimer, BA (Manitoba), MA (Toronto), MA, PhD (St. Michael's) G

Lecturers
R. Kooistra, BTh (Kampen), DTh (Amsterdam) P
S.A. MacDonald, BA, STB (Western Ontario), MA (San Francisco) J
T. Yoder Neufeld, BA (Manitoba), MDiv (Harvard) G

Faculty designated with suffix G (Conrad Grebel), J (St. Jerome's), P (St. Paul's), and R (Renison) are located in the respective Colleges.

Faculty Members of Religious Studies holding cross appointments to:

1. Fine Arts
2. History
3. Peace and Conflict Studies
4. Social Development Studies
5. Studies in Personality and Religion

Course Descriptions
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.

RS 100A-K
Introduction to Religion
An introduction to Religion, religious phenomena, beliefs, ideas, and experience through the study of material and examples from the various fields in Religious Studies.

RS 100A F.W 3C 0.5
Religions of the East
An introduction to the religions traditions of the East: history, religious beliefs and practices of Hinduism, Buddhism, Confucianism, Taoism and Shinto.

Area 1
RS 100B F,W 3C 0.5
Religions of the West
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.

Area 1

RS 100C F 3C 0.5
Religious Queste
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.

Area 5

RS 100E F,W 3C 0.5
Biblical Studies 1
A survey of the literature, history and religion of ancient Israel as seen in its cultural setting in the ancient Near East.

Area 3

RS 100F F,W 3C 0.5
Biblical Studies 2
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.

Area 3

RS 100H S,F,W 3C 0.5
Catholic Theology
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.

Area 4

RS 100K F,W 3C 0.5
Christian Theology: A Protestant Perspective
An introduction to the study of the sources and issues of traditional and contemporary, liberal and conservative Protestantism.

Area 4

RS 105A F 3C 0.5
Elementary Biblical Hebrew
An introductory course designed to tend 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 R&C 140-3C Taught at WL.U.

Area 1

RS 105B W 3C 0.5
Elementary Biblical Hebrew
A continuation of the introduction to Biblical Hebrew. Cross-listed as R&C 140-3C Taught at WL.U

RS 106A F 3C 0.5
New Testament Greek
An introduction to Greek grammar with appropriate grammatical exercises and development of vocabulary.

Area 3

RS 106B W 3C 0.5
New Testament Greek
A continuation of the study of Greek grammar with an exegetical study of some texts from the Gospel of Mark.

Area 3

RS 200 W 3C 0.5
The Study of Religion
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.

Area 3

RS 205 F,W 3C 0.5
The Hebrew Prophets
A study of the prophetic movement from Amos to Malachi in the historical, social, and religious context of Israel and the ancient Near East.

Area 3

RS 206 F 3C 0.5
The Parables of Jesus
Detailed examination of the stories Jesus told, their form, method, message and significance for religious thought, past and present.

Area 3

RS 209 F,W 3C 0.5
The Apostle Paul: Life and Letters
An examination of the career and thought of Paul as seen in his letters and in the Acts of the Apostles.

Area 3

RS 213 F,W 3C 0.5
Hinduism
A study of the development of religious thought in India from the Vedic Period to the present. The course will combine an historical survey with a study of representative texts from the religious, philosophical, social and political thought of the Hindus.

Area 1

RS 214 S 3C 0.5
Buddhism
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.

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 the Prophet 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 220 S 3C 0.5
Evangelical Christianity
A descriptive, historical and theological review of the wing of North American Christianity known as evangelicalism, fundamentalism, or revivalism.

Area 2

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 203

Area 5

RS 230 F 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,W 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 2320 W 3C 0.5
Jesus Christ in Historical Perspective
An examination of the historical development of the doctrine of Christ. Special attention will be devoted to the varying historical expressions of this doctrine and to their impact on current Christian belief and practice.
Area 3

RS 226 S,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 253 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.
Area 4

RS 254 W 3C 0.5
War and Peace in Christian Theology
The Contemporary Discussion. A survey of Christian teaching on war and peace, focusing on the twentieth century discussion.
Area 4

RS 235 F 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 F 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 261 W 3C 0.5
Women and the Great Religions
Through a review of the teachings of the great religious traditions about women, this course aims to arrive at a global view of the situation of women in the world of religion. On the basis of the evidence gathered, it will attempt an estimation of the role of religion as an intimate and important influence on human development.
Area 5

RS 263 F,W 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 265 FIC,1S 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 2C,1S 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,W 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 behaviour.
Area 5

RS 282 S 2C,1D 0.5
New Perspectives in Sacramental Theology
A discussion of sacramental theology in the light of the ongoing renewal, inaugurated by the Second Vatican Council, through a study of the individual sacraments and their role as meaningful cul
t signs in contemporary Roman Catholicism.
PreReq: Second-year standing or consent of instructor
Area 4

RS 291 A-D
Studies in the History of Religion
Area 5

RS 296 Directed Reading in Special Subjects
Area 4

RS 305 A/B F,W 3C 0.5/0.5
Intermediate New Testament Greek
PreReq: RS 106 or consent of instructor.
Area 3

RS 309 W 3C 0.5
New Testament Themes
Area 4

RS 311 F 3C 0.5
Hindu Scriptures
Selected Vedic Hymns and Upanishads as well as the Bhagavad Gita and Ramayana will be read in translation and critically analyzed with the help of a variety of modern commentaries.
PreReq: RS 100A or 213
Area 1
R S 313 W 3C 0.5
Indian Spirituality in the Modern Era
This seminar course will provide for 'in-depth' studies of some of the creators of a modern Hindu consciousness. Vivekananda, Gandhi, Tagore, Aurobindo and contemporary gurus.
Prereq: RS 100A or consent of the instructor
Area 1

R S 314 W 3C 0.5
Zen Buddhism
A seminar based on eastern and western interpretations of the Zen tradition. First half, basic Buddhist concepts and principles; second, a study of classical Zen literature.
Prereq: RS 100A or RS 214 or consent of instructor
Area 1

R S 322 W 3C 0.5
Radical Reformation
A study of Anabaptism and its place in the history of the Christian Church and of the Reformation period.
Prereq: Second year standing
Area 2
Cross-listed as HIST 348

R S 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

R S 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

R S 336 W 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

R S 339 F 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

R S 344 F 3C 0.5
Theology of Radical Protestantism
A study of the development of beliefs of the churchothe in the Radical Reformation tradition (Mennonites, Baptists, Quakers) examined in their ecumenical contexts.
Prereq: R S 230 or 231 or consent of instructor
Area 4

R S 350 S.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: R S 230 or 231 or consent of instructor
Area 2

R S 360 F.W 3C 0.5
Religion and the Arts
A consideration of the spiritual dimension in art, both sacred and secular. An exploration of the quest for meaning in the various arts-painting, music, architecture, sculpture, dance, and cinema-encountered through slides, films, recordings, and readings.
Prereq: R S 100C or 266 or 267, or consent of the instructor
Area 5

R S 369B S 1.0
Study Travel Seminar in Reformation Studies

R S 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

R S 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

R S 382 S.W 3C 0.5
Theology of Marriage
A study of the development of the theology of marriage in the Christian tradition.
Prereq: R S 236/256 or 281/282 or consent of instructor
Area 4

R S 396 399
Directed Reading in Special Subjects

R S 400A-H
Special Topics in Religious Studies
Special topics will be offered in 1986-87. Consult department.

R S 490A S,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

R S 590-597 F,W R 0.5
Directed Research in Special Subjects for Graduate Students

COURSES NOT OFFERED 1987-88
R S 100D Religious Movements
R S 203 Wisdom Literature in the Old Testament
R S 206 Modern Study of Jesus
R S 225 The History and Culture of the Orthodox Church
R S 232A Jesus Christ in Contemporary Perspective

R S 246 Religion in the Canadian Experience
R S 265 Unity and Diversity in Canadian Religion
R S 269 Myth and Symbols of the Religions of India
R S 274 Religious Approaches to Personal Crises
R S 275 Religion and Psychotherapy
R S 281 Theology of Worship and Sacrament
R S 290A The Religious Experience of the Young
R S 290B The Just Society
R S 290C Gospel and Liberation
R S 302 The Gospel of John
R S 306 Intermediate Biblical Hebrew
R S 307A-D Selected Topics in Biblical Studies
R S 310 The Sacred Book of Islam
R S 315 The Narrative Expression of Canadian Native Religions
R S 316 Canadian Native Religious Traditions
R S 318 Islam and Christianity
R S 323 Medieval Church History 312-1122
R S 324 Medieval Church History 1412-1449
R S 334 Islamic Theology, Philosophy and Mysticism
R S 335 Modern Theology
R S 338 Theology in North America
R S 400E Feminism and Christian Theology
R S 450A Study Term Abroad

SCI 111 W 3C 0.5
From Matter to Man
Chemistry: The nature of matter, atomic and nuclear reactions, chemical bonds and the formation of molecules.
Six Weeks.
Biology: The nature of DNA, the genetic code, protein synthesis, cells, organic evolution and chemistry of life, human traits.
Six Weeks.
A special course available to students in the Mathematics Faculty who do not have a strong science background, especially at the Secondary School Year.
Five level. Not open to students registered in the Faculty of Science.

SCI 205 F.W 3C 0.5
Physics of High Fidelity Sound Reproduction
Applies elementary physical principles to the study of the components of high fidelity systems. Will convey an appreciation of the physics of such systems and an understanding of the specifications of modern equipment. Includes several evening clinics during which interested students can measure their own or available systems using laboratory measuring equipment.
Prereq: At least one year of Secondary School Physics

SCI 206 F.W 2C,1T 0.5
Technical Writing and Speaking
Retrieving information and imparting the information you have to others; the art of speaking and writing; modern aids to producing scientific papers, reports, letters, etc.; and common errors in writing.

SCI 219 F 2C 0.5
Chemistry in Modern Society
The impact of chemistry on modern society will be considered by discussion of a number of topics including: marijuana and other non-medical drugs; food additives; birth controls; cancer-causing chemicals; pesticides and other chemical methods to control insects; chemical warfare.
Prereq: At least one year of Secondary School Chemistry

SCI 220 W 2C 0.5
Chemistry of Pollution
A study of the chemistry involved in pollution problems encountered with consumer products and in selected industries. Progress in 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

SCI 237 F 3C 0.5
Descriptive Astronomy
A survey course in astronomy intended for non-science students (primarily arts, environmental studies, human kinetics and leisure studies students). The solar system, stars, the galaxy, galaxies and the universe.
Open to first-year or upper-year students.
Not for Engineering, Mathematics or Science students.

SCI 238 W.S 3C 0.5
Descriptive Astronomy
A survey course in astronomy intended for mathematics, engineering and science students. Newtonian developments in the solar system, the sun and planets, stars, the Milky Way, galaxies and cosmology.
Open to first-year or upper-year students in all faculties.

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 environment: 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 251 F 2C 0.5
Human Genetics
An examination of recent advances in human heredity including the genetics, cytological and biochemical aspects of individual inheritance. The principles of human population genetics will be discussed. The social implications of some of the modern discoveries will be stressed.
Students whose major field is Biology may not take this course for credit.
Offered only by Correspondence for 1987-88.
SCI 252 W 3C 0.5

**Biology and Society**

A topical approach to problems of human society directly related to biological systems. Areas for discussion in any one year will be chosen from a wide range of topics. These will be dealt with both from the theoretical and practical aspects of modern biology.

Offered only by Correspondence for 1987-88.

SCI 255 W 2C, 1T 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

Students whose major field is Biology may not take this course for credit.

SCI 260 W 3C 0.5

**The Science of Sensation**

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**

Social and economic impacts of science. Analysis of biotechnology as an area of science expected to have substantial impacts on modern society. Aspects of this issue will be critically examined in this term-taught, multi-disciplinary course.

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.

Liberal Science Core Course

SCI 268A-Z

**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

SCI 351 F, W, S T 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 233

Offered only by Correspondence for 1987-88.

SCI 352 F, W, S T 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 233

Offered only by Correspondence for 1987-88.

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.

SCI 369 F, W 1T 0.5

**Major Paper and General Examination**

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 Co-op Applied Chemistry, Co-op Applied Physics, Co-op Applied Earth Sciences, Co-op Biology and Co-op Biochemistry (Biology and Chemistry only)]

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-ordination and Placement 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

**The Seas and Man's Effects Upon Them**

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.

SCI 454 W 2C 0.5

**The Inland Waters and Man's Effects Upon Them**

Study of lakes, rivers and streams from a biological point of view, and consideration of the effects of exploitation and pollution upon the animals and plants that inhabit them.

Not available to students who have taken BIOL 451.

Students whose major field is Biology may not take this course for credit.

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.
Social Development Studies

Professor, Principal of Renison College
D.L. Campbell, BA (Carleton), MSC (Econ) (London), R

Associate Professor, Undergraduate Officer
M. Smyth, BA (Toronto), MA, PhD (York), R

Professor Emeritus
D.G.S. M'Timkulu, BA, MA (South Africa), MA (Yale), PhD (Natal), R

Associate Professor, Co-ordinator of English Language Programs
J. Miller, BA, BLS (McGill), MA, MPHIL (Waterloo), PhD (York), R

Adjunct Assistant Professor, Co-ordinator of Placements, Diploma Program
K. Bailey-Robinson, BA (McMurray College), MSW (WLU), R

Professor
J.O. Towler, BA (Toronto), MEd, PhD (Alberta), R

Associate Professors
M.S. Bird, BA, MA, PhD (Iowa), R

M.D. Bryant, BA (Concordia College), St. Michael's R
J.T. Harris, BMus (Temple), MSW (Pennsylvania), R
B. Hyma, BSc, MSc (Madras), MA (Sheffield), PhD (Pittsburgh), R
R. Lahn, BSc (Fordham), PhD (Waterloo), R
M. Nagler, BA (British Columbia), MA (Chicago), PhD (Stirling), R
M. Zentner, BA (Temple), MSW (Kansas), R

Assistant Professors
J. Majoros, BA, MA (CUNY), MSW (SUNY, Albany), PhD (Toronto)
K. Mott, BA (WLU), BD (Union Theo., Vancouver) MSW (SUNY, Albany)

Adjunct Faculty
B. Abbott, BA (Waterloo), MSW (WLU), R
J. Banbrick, BA, MA (Guelph), PhD (Windsor), R
A. Bros, BA (Waterloo), MSW (WLU), R
L. Fusco, BA (Hofstra), MA (Chicago), R
D. Payne, BA (Sir George Williams), MSW (WLU), R
M. Thompson, 5th (Wycliffe), RN (Wellesley), BA (Waterloo), MSW (WLU), R

Lecturers
B. Bell-Rowbotham, BA, MA (Western), R
T. Brenner, BA (Waterloo), MSW (WLU), R
P. Perry, BA, MA, PhD (Western), CPsych, R
R. Finch, BA (UW), MSW (WLU), R
C. Gillen, BSc (Pittsburgh), MA, PhD (Windsor)
C. Hollidge, BA (Waterloo), MSW (WLU), R
J. Turner, BA, BSW, MSW (Toronto), R
V. Welt, BA, MSW (Toronto)
J. Zinkann, BA (Toronto), BLL (Osgoode), MWS (WLU), R

Faculty Members of Renison College holding cross appointments to:
1. Political Science
2. Religious Studies
3. Geography
4. Psychology
5. Sociology
6. Fine Arts
R refers to faculty members at Renison College

M. S. Bird, BA, MA, PhD (Iowa), R

Course Descriptions

Social Development Studies

Course Descriptions

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 psycho-social 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,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 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 252R or its equivalent also recommended.
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.

PSYCH 121R W 3C 0.5
Introductory Psychology (Special Topics)
A continuation of PSYCH 120R with in-depth study of some selected topics.

PSYCH 220R F 3C 0.5
Social Psychology
Examination of psychological principles involved in individual-society interaction. Topics may include research methods, self, sexual attitudes and behaviour, person perception, attitudes, affiliation, aggression, altruism, groups, environment and behaviour, loneliness, social psychology and legal process.

PSYCH 221R W 3C 0.5
Interpersonal Interaction
A consideration of selected theories of interpersonal interaction. Topics include F. Goftman, non-verbal communication, H.S. Sullivan, transactional analysis, the double-bind theory, R.D. Laing, the basic dimensions of interpersonal behaviour, and social exchange.

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.

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.

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.

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.
SOCL 222R F,W,S 3C 0.5
Social Casework Technique Seminar
A presentation of some of the theoretical constructs necessary for the understanding of social work intervention. Emphasis in the course will be on the theoretical.
Prereq: SOCWK 220R or consent of instructor

SOCL 257R F,W,S 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 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

SOCL 260R W 3C 0.5
Religion and Social Work Practice
The course explores the relevancy and impact of the Christian faith in social work practice and examines some of the ethical and value conflicts facing the Christian and non-Christian social worker in practice today.
Prereq: SOCWK 120R or consent of instructor

SOCL 270R 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

SOCL 271R F,W,S 3C 0.5
Community Organization 2
An examination of innovative social work settings and how they are structured and operated.
Prereq: SOCWK 120R or consent of instructor

SOCL 311R F,W,S 4C 0.5
Social Casework 1
Presentation of the value knowledge, skill base, principles and purposes of the profession, and an examination of methods of practice. Traditional and innovative social work settings are addressed. History of Social Work and its influence on contemporary practice is reviewed.

SOCL 312R F,W,S 3C 0.5
Social Casework 2
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

SOCL 313R F,W,S 3C 0.5
Community Organization 3
An examination of innovative social work settings and how they are structured and operated.
Prereq: SOCWK 120R or consent of instructor

PSYCH 369R/369R 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

SOCWK 101 W S 0.0
Social Work Diploma students only

SOCWK 120R F,W,S 3C 0.5
Introduction to Social Work
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 121R F,W,S 3C 0.5
Social Casework 1
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 122R F,W,S 3C 0.5
Social Casework 2
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 123R F,W,S 3C 0.5
Social Casework 3
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 321R F,W,S 3C 0.5
Social Work with Families
Presentation of some of the theoretical constructs necessary for the 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
Presentation of some of the theoretical constructs necessary for the 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 350R F,W,S 3C 0.5
Social Casework 2
Presentation of some of the theoretical constructs necessary for the 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 355R F,W,S 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,W,S 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.

SOCWK 357R F,W,S 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.

SOCWK 358R F,W,S 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.
SOGWK 367R W.S 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: SOGWK 120R or consent of instructor

SOGWK 366R/368R 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 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 from the program.
Prereq: Permission of Undergraduate Officer

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 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.S 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
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 368R W 3C 0.5
The Sociology of Spoiled Identity
Spoiled identity resulting from deviant status inhibits if not prevents acceptance and social mobility. Consequences of spoiled identity, lowered status positions and deviant criminal and "social" adaptations are examined from a symbolic interactionist perspective.
Prereq: An introductory Sociology course

SOC 369R F 3C 0.5
Custodial and Rehabilitative Institutions
"Total institutions" are concerned with resocialization of "inmates". The philosophies, organization, goals and effectiveness in modifying and controlling behaviour, of maximum security prisons, mental hospitals, isolated work environments and concentration camps constitute the central focus.
Prereq: An introductory Sociology course

STV 100 0.5
Society, Technology and Values: An Introduction
This is the introductory course in the STV Option. An examination of the implications of technological innovation, with emphasis on the experience of work as a major theme, will be undertaken. This course will be team taught.
Prereq: None

STV 200 0.5
Society, Technology and Values: Projects Course
The second course in the STV sequence is structured as a self-directed group learning exercise focusing on an intensive study of a particular technology in its societal context or, alternatively, on an intensive study of a commonly held value and its interaction with one or several technologies.
Prereq: Registration in the STV Option and successful completion of STV 100

STV 400 0.5
Society, Technology and Values: A Senior Project
In this, the final course in the STV Option, students will undertake an independent but supervised research project at the level of a senior honours essay or equivalent level.
Prereq: Registration in the STV Option normally at the fourth-year level and successful completion of STV 100 and 200
Department of Sociology

Professor, Chairman
D. Kubat, MA (Kansas), PhD (L. Maximilian, Munich)

Professor, Associate Chairman for Graduate Studies
H.J. Failing, BA, BSc, MA (Sydney), PhD (Australian), FRSC

Associate Professor, Associate Chairman for Undergraduate Studies
R.C. Prus, BA (Manitoba), MA, PhD (Iowa)

Professors
W.F. Forbes,2 BSc, PhD, DSc (London), DIC, ARCS
B.D. McPherson,5 BA, MA (Western Ontario), PhD (Wisconsin)
C. Redekop, BA (Goshen), MA (Minnesota), PhD (Chicago) G
W.G. Scott, BA (Western Ontario), MA (Toronto) Honorary Member of the University, (Retired)*
E.W. Vaz, BA, MA (McGill), PhD (Indiana)
K. Westhus, BA (Conception), MA, PhD (Vanderbilt), Recipient of the Distinguished Teacher Award
J. Zuzanek,6 MA (Moscow State University), CSS (Prague Institute of Sociology), PhD (Charles University, Prague)

Associate Professors
J.E. Curtis,1 BA (Sir George Williams), MA (Central Michigan), MA (Cornell)
F. Desroches, BA (Waterloo), MA (Toronto), PhD (Waterloo), J
F.A. Fasick, BA (Pennsylvania State), MA, PhD (Columbia)
J. Goyerder, BA (Bishop's), MA, PhD (McMaster)
R.D. Lambert, BA, MA (McMaster), PhD (Michigan)
S.A. McDaniel,7 BA (Massachusetts), of the Distinguished Teacher Award
M.I. Nagler, BA (British Columbia), MA (Chicago), PhD (Stirling), R
M. Shimo, BA (International Christian, Japan), MA, PhD (British Columbia) J
J.B. Whitney,8 BA (Western Ontario), MA, PhD (Toronto)
A. Wipper, BA, MA (McGill), PhD (California, Berkeley)

Assistant Professors
P.J. Carrington, BA (Harvard), MA, PhD (Toronto)

S.A. Kent, BA (College Park, Maryland), MA (American), MA, PhD (McMaster)
N. Theberge,3 BA (Massachusetts), MA (Boston), PhD (Massachusetts)
G.K. Warnier, BA (British Columbia), MA (Wisconsin), PhD (British Columbia)

Research Assistant Professors
A.J. Plenas, BA (Waterloo), MA (McMaster), PhD (Victoria, New Zealand), SSHRC Private Scholar
A.V. Wister, BA, MA, PhD (Western Ontario), SSHRC Post-doctoral Fellow

Lecturer
B. Hanson, BA (Western Ontario), MA (Carleton)

Faculty Member of Sociology holding cross appointment to:
1Kinesiology

Faculty Members holding cross appointments to Sociology from:
2Statistics and Actuarial Science
3Kinesiology
4Recreation and Leisure Studies
5Human Kinetics and Leisure Studies
6Statistics and Actuarial Science
7Health Studies

1Also 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

Course Descriptions

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, and social change. Special attention is given to Canadian society.

SOC 102 F,W 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 F,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 perspective. 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 Roles
An examination of male and female roles in contemporary Canadian society. Current and past roles of both sexes in different societies are considered. Selected topics of interest include sex role identity and its development, male role change, media images of men and women and men's and women's liberation.

Prereq: SOC 101 or consent of instructor

SOC 207 F,S 2C 0.5
Sociology of Education
Attention will be focused on the topics 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 208 F 3C 0.5
Education and Native Peoples
An examination of some of the limitations and alternatives to formal schooling employed mainly by Canadian and Australian indigenous groups (Indian, Inuit, and other aboriginal groups). Special emphasis is placed on skill training and the group's search for identity.
Offered at St. Jerome's College

SOC 209 F 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 219 3C 0.5
Catholic Sociological Thought
An analysis of the distinctive emphasis and perspectives which characterize contemporary sociological theory in Catholic cultures. The course will focus on theories of the family, the community, human sexuality, politics and the economy.

SOC 220 F,W 3C 0.5
Sociology of Business Management
A study of the structure, stratification and social roles in the organization, operation and management of small businesses. Attention will also be given to decision making, labour-management relations, the institutionalization of value systems, and job satisfaction.
Offered at Conrad Grebel College

SOC 222 2C 0.5
Juvenile Delinquency
A systematic analysis and criticism is presented of biological, psychological, psychosocial 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,S 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 Henson College.

SOC 224 2C 0.5
Law and Order: Regulating Deviance
Focusing on the "processes and problematic 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 226 3C 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 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 0.5
Sociology of Corrections
Decisions to process offenders and the role of social factors in the Canadian criminal justice system are critically examined. Focal issues include police discretion, the legal profession and prison systems.
Prereq: SOC 101

SOC 232 0.5
Technology and Social Change
This course will relate 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

SOC 233 2C 0.5
Social Psychology of Beliefs and Attitudes
Examines the sources, organization and distribution of beliefs and attitudes and their significance for the individual and society.
Prereq: SOC 101 or PSYCH 101 or consent of instructor

SOC 234 2C 0.5
Social Psychology and Everyday Life
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.
Prereq: SOC 101 or consent of instructor
Formerly SOC 104

SOC 235 2C 0.5
Communication
An analysis of the role of language and other symbol systems in social interaction, the interplay between communication and the social system, the formation of attitudes through language; social and individual disorders as caused by, and reflected in, the breakdown in the communication process.
Prereq: SOC 101 or consent of instructor

SOC 236 2C 0.5
Social Movements
The analysis of varieties of social movements and their relationships to social organization and social change.
Prereq: SOC 101 or consent of instructor

SOC 240 2C 0.5
Social Stratification
An analysis of the role of social factors in the Canadian economic system with a particular emphasis on ethnic relations, the institutionalization of value systems, and job satisfaction.
Prereq: SOC 101
SOC 237 2C 0.5
Collective Behaviour
The sociological analysis of the behaviour of crowds, mobs, publics and related phenomena and their relationships to social organization and social change.
Prereq: SOC 101 or consent of instructor
Formerly SOC 106

SOC 238 2C 0.5
Sociology of Marketing and Sales
This course considers the social processes by which people "do business". Focusing on day to day exchanges, ongoing relationships within the business and consumer community are examined from an interactionist perspective.
Prereq: SOC 101 or consent of instructor

SOC 242 2C 0.5
Industrial Sociology
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.
Prereq: SOC 101 or consent of instructor

SOC 243 S 2C 0.5
Occupational Sociology
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.
Prereq: SOC 101 or consent of instructor

SOC 247 2C 0.5
Death and Social Structure
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.
Prereq: SOC 101 or consent of instructor

SOC 248 2C 0.5
Health, Illness and Society
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.
Prereq: SOC 101 or consent of instructor

SOC 249 3C 0.5
Sociology of Mental Disorder
An examination of sociological research and theory in the field of mental illness, especially as it relates to the family. Such topics as psychiatric hospitals, public attitudes and social stigma, aftercare and rehabilitation, and the epidemiology of mental illness will be examined.
Prereq: SOC 101 or permission of the instructor

SOC 252 2C 0.5
Migration and Society
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.
Prereq: SOC 101 or consent of instructor

SOC 253 2C 0.5
Population in Canadian Society
Study of the basic demographic processes in the population of Canada. Demographic implications for selected social institutions. Use of Canadian enumeration and registration data.
Prereq: SOC 101 or consent of instructor

SOC 254 2C 0.5
Comparative Social Structure
General theoretical and methodological issues facing comparative sociology; comparative methods at work in the treatment of Western and non-Western societies (including Canada).
Prereq: SOC 101 or consent of instructor

SOC 256 W 2C 0.5
Ethnic and Racial Relations
Relations between different racial and cultural groups, analysis of majority-minority group status with special reference to Canada.
Prereq: SOC 101 or consent of instructor

SOC 263 F 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 W 2C 0.5
Sociology of Religion
Religion is defined broadly and its relationship 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
Also offered at St. Jerome's College.

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 2C 0.5
The Mennonites as a Sociological Community
A case study of the Waterloo County Mennonites as a social system. Attention is paid to a methodology for studying a religious-cultural group by engaging in direct field studies. The community, charter resources, integration, family system, life ceremonies, adaptation to change, and survival techniques will be examined.
Prereq: An introductory social science course
Offered at Conrad Grebel College
SOC 290 F.W 2C 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.

SOC 286 W 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 W 2C 0.5

Community, Communities and Utopias
Using communes and the writings of utopia 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 newer learning theories and programs. Themes will be selected and studied in depth on a seminar basis.
Prereq: SOC 101 and 207
Offered at Conrad Grebel College

SOC 310 2S 0.5

Seminar in Group Dynamics
An analysis of naturally occurring and experimental groups from a social structural perspective. The study of processes of internal differentiation, integration, authority, etc; and the relationships between small groups and their environment.
Prereq: SOC 101 or consent of instructor

SOC 321 F 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. Equivalent to: KIN 330, ERS 150, P SCI 315, PSYCH 291, REC 270A, ISS 251R.
Prereq: SOC 101 or consent of instructor

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 321 or consent of instructor

SOC 323 2C 0.5

Issues in Third-World Development
A study of, and sensitization for possible careers in, Third-World development and modernization with special emphasis on poverty issues, minority group problems and the roles of governmental and voluntary agencies.
Prereq: SOC 225 or permission of the instructor
Offered at Conrad Grebel College

SOC 325 2C 0.5

Crime as Business
Examines the inter-relatedness 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 and SOC 242

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 301

SOC 348 3C 0.5

Sport in Society
An introduction to the sociology of sport. Utilizing the major frames of reference the social sciences, the functions of sport in contemporary society is examined.
Prereq: SOC 101 and one other Sociology course
Cross-listed as REC 203 and KIN 252
### Course Descriptions

#### Sociology

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>Credits</th>
<th>Hours</th>
<th>Prerequisites</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOC 354</td>
<td>World Population Problems</td>
<td>2C</td>
<td>0.5</td>
<td></td>
<td>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 263</td>
</tr>
<tr>
<td>SOC 360</td>
<td>Social Psychology and Political Participation</td>
<td>2C</td>
<td>0.5</td>
<td></td>
<td>A seminar examining the relations between the social psychological characteristics of Canadians and their political behaviour, with an emphasis on public opinion and voting. Prereq: SOC 101 or consent of instructor</td>
</tr>
<tr>
<td>SOC 364</td>
<td>Social Change</td>
<td>W</td>
<td>2C</td>
<td>0.5</td>
<td>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</td>
</tr>
<tr>
<td>SOC 366</td>
<td>Urban Sociology</td>
<td>2C</td>
<td>0.5</td>
<td></td>
<td>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</td>
</tr>
<tr>
<td>SOC 370</td>
<td>Sociology of Law</td>
<td>2C</td>
<td>0.5</td>
<td></td>
<td>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.</td>
</tr>
<tr>
<td>SOC 371</td>
<td>Philosophy of Social Science</td>
<td>3C</td>
<td>0.5</td>
<td></td>
<td>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</td>
</tr>
<tr>
<td>SOC 377</td>
<td>Studies in the Sociology of the Mennonites</td>
<td>2C</td>
<td>0.5</td>
<td></td>
<td>This seminar will devote attention to research methods, sociological theory and interdisciplinary approaches to the study of Mennonite communities and culture. Prereq: Permission of the instructor Offered at Conrad Grebel College.</td>
</tr>
<tr>
<td>SOC 378</td>
<td>Sociology of Women</td>
<td>3C</td>
<td>0.5</td>
<td></td>
<td>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</td>
</tr>
<tr>
<td>SOC 380</td>
<td>Qualitative Methods: Field Research</td>
<td>2C</td>
<td>0.5</td>
<td></td>
<td>An application of symbolic interactionist theory, this course examines the contingencies affecting data collection and analysis of on-going group life. While doing field work, students have an opportunity to examine basic features of interactionist thought. Prereq: SOC 101</td>
</tr>
<tr>
<td>SOC 381</td>
<td>Quantitative Methods</td>
<td>2C</td>
<td>0.5</td>
<td></td>
<td>Design and data analysis in contemporary sociological research, with an emphasis on the analysis of secondary data and computer applications. Prereq: SOC 101 and SOC 280</td>
</tr>
<tr>
<td>SOC 382</td>
<td>Survey Methodology</td>
<td>3C</td>
<td>0.5</td>
<td></td>
<td>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.</td>
</tr>
<tr>
<td>SOC 390</td>
<td>Sociology of the Family</td>
<td>2C</td>
<td>0.5</td>
<td></td>
<td>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 271 is recommended)</td>
</tr>
<tr>
<td>SOC 406</td>
<td>Contemporary Sociological Theory</td>
<td>W</td>
<td>2C</td>
<td>0.5</td>
<td>Development of sociological theory in the 20th century. Included is discussion of current theoretical work. Prereq: SOC 101 and one other Sociology course (SOC 271 is recommended)</td>
</tr>
<tr>
<td>SOC 440A-X</td>
<td>Directed Readings</td>
<td></td>
<td></td>
<td></td>
<td>Selected readings and essay assignments under the direction of a faculty member. Prereq: Fourth-year standing in Sociology</td>
</tr>
<tr>
<td>SOC 440B</td>
<td>Directed Readings in Deviance, Criminology, and Corrections</td>
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</tr>
<tr>
<td>SOC 440C</td>
<td>Directed Readings in Social Psychology</td>
<td>F</td>
<td>W,S</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>SOC 440D</td>
<td>Directed Readings in Quantitative Methods and Statistics</td>
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<tr>
<td>SOC 440E</td>
<td>Directed Readings in Social Theory</td>
<td>F</td>
<td>W,S</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>SOC 440H</td>
<td>Directed Readings in the Family</td>
<td>F</td>
<td>W,S</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>SOC 440J</td>
<td>Directed Readings in the Marketplace</td>
<td>F</td>
<td>W,S</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>SOC 440K</td>
<td>Directed Readings in Industry, Work and Complex Organizations</td>
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<tr>
<td>SOC 440M</td>
<td>Directed Readings in Religion</td>
<td>F</td>
<td>W,S</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>SOC 440N</td>
<td>Directed Readings in Demography</td>
<td>F</td>
<td>W,S</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>SOC 440S</td>
<td>Directed Readings in Developing Nations</td>
<td>F</td>
<td>W,S</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>SOC 440T</td>
<td>Directed Readings in Sex Roles</td>
<td>F</td>
<td>W,S</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>SOC 440X</td>
<td>Directed Readings in Medical Sociology</td>
<td>F</td>
<td>W,S</td>
<td>0.5</td>
<td></td>
</tr>
</tbody>
</table>

#### Notes
- Course codes are listed in the leftmost column, followed by the title and credits. Additional details such as prerequisites and descriptions are provided in the right columns.
- Some courses are cross-listed, for example, SOC 364 W and SOC 364.
- Prerequisites are indicated in parentheses next to course titles.
- Some courses include additional notes, such as the requirement for third-year standing or by permission for SOC 370.
Course Descriptions

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,S 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 W,S 3C,1L 0.5
Introduction to Spanish 2
A continuation of SPAN 101.
Prereq: SPAN 101 or consent of 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 selections from literary works and grammar review. Language laboratory also used to increase understanding and speaking skills.
Prereq: SPAN 102 or consent of 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 Department
(WLU 122/172-03).

SPAN 203 F 3C
Spanish Civilization 1
Development of Spanish Civilization and culture from the earliest times to the present.
Taught in English.
(WLU 203/253-30).

SPAN 204 W 3C
Spanish Civilization 2
A continuation of SPAN 203.
Taught in English
(WLU 213/263-03).

SPAN 205 F 3C
Survey of Spanish Literature 1
Readings of major authors and study of the main literary trends from the middle ages to the 18th century.
Prereq: SPAN 201B
(WLU 205/255-30).

SPAN 206 W 3C
Survey of Spanish Literature 2
A continuation of SPAN 205 from the 18th century to the present.
Prereq: SPAN 205
(WLU 206/256-03).

SPAN 217 F 3C
Spanish American Civilization 1
A survey of the geography, history and problems of Spanish America from pre-Columbian times to the present.
Taught in English.
(WLU 223/273-30).

SPAN 218 W 3C
Spanish American Civilization 2
A survey of the art, music and literature of Spanish America from pre-Columbian times to the present.
Taught in English.
(WLU 233/283-03).

SPAN 227 F 3C
Survey of Spanish American Literature 1
Literary trends and most significant works from the conquest to the 19th century.
Prereq: SPAN 201B
(WLU 208/258-30).

SPAN 228 W 3C
Survey of Spanish American Literature 2
A continuation of SPAN 227
Prereq: SPAN 227
(WLU 209/259-03).

SPAN 251A F 3C
Composition and Conversation 1
Intensive language study based on literary texts, including vocabulary, grammar and syntax. Introduction to commercial Spanish. Essay writing, translation and discussion.
Prereq: SPAN 201B or consent of the Department
(WLU 211/261-30).

SPAN 251B W 3C
Composition and Conversation 2
A continuation of SPAN 251A.
Prereq: SPAN 251A
(WLU 212/262-03).
Course Descriptions
Spanish Systems Design Engineering

Department of Systems Design Engineering

Professor, Chairman
K. Husayn, MSC (Istanbula), PhD
(London, DSc (Eng) (London), PEng
Recipient of the Distinguished Teacher Award

Professor, President of the University
D.T. Wright, BASc (Toronto), MS (Illinois),
PhD (Cambridge), DEng (Carleton),
LLD (Brock) DSc (Memorial), LLD
(Concordia), LHD (Northeastern),
PEng

Professor, Associate Dean,
Undergraduate Studies, Faculty of
Engineering
P.H.O.N. Roe, BASc (Toronto), MASc,
PhD (Waterloo), PEng

Associate Professor, Associate Dean for
Computing, Faculty of Engineering
B.L. Wills, BASc, MASc, PhD (Waterloo),
PEng

Professor, Associate Chairman, Graduate
Studies
M. Chandrashekar, BTech (Indian Insti-
tute of Technology, Kanpur), MASc,
PhD (Waterloo), PEng

Professor, Associate Chairman,
Undergraduate Studies
K.W. Hipel, BASc, MASc, PhD
(Waterloo), PEng

Professors
W.K. Adrian, Dipl-Ing (TH Darmstadt), Dr
 habil, apl Professor (Karlsruhe)
T.M. Fraser, MB, ChB (Edinburgh), MSC
(Ohio State), LMCC, FACPM, PEng
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inois), PhD (Michigan State), PEng
A. Pugh, BSc (Wales), PhD
(Nottingham), CEng, REE, RERE
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agpur), Dr Ing (Dresden), PEng
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(Dalhousie), PEng
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PhD (Cambridge), PEng

Associate Professors
C.K.G. Hahn, MASc (Waterloo)
M.E. Jenigian, SB, SM, PhD (Massachu-
setts Institute of Technology), PEng,
Recipient of the Distinguished Teacher
Award

SPAN 265 F 3C 0.5
The Spanish Short Story
Selected stories from outstanding writers
in Spain, primarily of the 20th century.
(WLU 204/254-3)

SPAN 266 W 3C 0.5
The Spanish American Short Story
Selected stories from outstanding writers
of the 19th and 20th centuries in Spanish
America.
(WLU 214/264-03)

SPAN 311A F 2C 0.5
Applied Spanish Stylistics 1
A workshop-type course designed to
develop advanced oral-aural skills,
consecutive translation and composition.
Written and oral translation of journalistic
material. Frequent class presentations
are required of students.
Prereq:SPAN 351A/351B
(WLU 311/461-22)

SPAN 311B W 2C 0.5
Applied Spanish Stylistics 2
A continuation of SPAN 311A.
Prereq:SPAN 311A
(WLU 311/461-22)

SPAN 324 W 3C 0.5
Contemporary Spanish Theatre and
Poetry
An in-depth analysis of the works of
Lope-Rubio, Casona, Mihura, J.R.
Jiménez, Salinas, D. Alonso, Alexandre,
et al, with emphasis on the works of
Buero, Sastre and García Lorca.
Prereq:SPAN 206
(WLU 324/474-20)

SPAN 326 F 2C 0.5
The Spanish Golden Age: Theatre
and Poetry
A study of one verse drama each of
Lope de Vega, Tirso de Molina, and
Calderón de la Barca; also outstanding
sonnets by Garcilaso, Herrera, Góngora,
Lope and Quevedo.
Prereq: SPAN 206
(WLU 326/476-20)

SPAN 327 F 3C 0.5
The Spanish Golden Age: Don
Quijote
A literary analysis of Don Quijote through
diverse criticism of the masterpiece.
Prereq: SPAN 205
(WLU 327/477-20)

SPAN 344 F,W 2T 0.5
Special Topics in Hispanic Studies
By special arrangement, an individual
student or a small group of students will
follow a course of study under the super-
vision 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 301/383-20)

SPAN 351B W 2C 0.5
Advanced Composition and
Conversation 2
A continuation of SPAN 351A.
Prereq: SPAN 351A
(WLU 302/382-02)

SPAN 388 F 2C 0.5
Contemporary Spanish American
Theatre
A study of the most important dramatists
of Latin America. Particular attention will
be paid to the political, historical, cultural
and esthetic context which inform the
works studied.
Prereq: SPAN 206
(WLU 303/399-20)

SPAN 446 W 2C 0.5
Medieval Spanish Literature
Close study of the Poema de Mio Cid. El
libro de buen amor and La Celestina plus
selections from other works through the
15th century
Prereq: SPAN 206
(WLU 318/468-02)

SPAN 497 W 2C 0.5
The Novel in South America
A study in depth of the major novelists of
Spanish America outside Mexico, with
emphasis on the 20th century.
Prereq: SPAN 228 or consent of
Department
(WLU 329/479-20)

COURSES NOT OFFERED 1997-98
SPAN 111 Conversational Spanish
SPAN 304 Romanicism in Spain
SPAN 305 The Spanish Realist Novel
SPAN 322 The Generation of 98:
Fiction
SPAN 325 Contemporary Spanish Novel
SPAN 331 Contemporary Spanish Essay
SPAN 333 Modern Spanish American
Poetry
SPAN 334 Modern Spanish American
Prose
SPAN 387 Women and Spanish
American Literature
SPAN 445 History of the Spanish
Language
SPAN 495 The Novel in Mexico
Assistant Professors
H.C. Shen, BASc, MASc, PhD
D.M. Kligour, BASc, MSc, PhD (Toronto)
M. Kamei, BASc (Alexandria), MSc (McMaster), PhD (Toronto), PEng
G. R. Heppler, BASc, MSc, PhD (Toronto), PEng
J. J. Kay, BASc (McGill), MASc, PhD (Waterloo)
H. C. Shen, BMath (Waterloo), MSc (Toronto), PhD (Waterloo)

Faculty Members holding cross appointments to Systems Design
Engineering from:
1. Environment and Resource Studies
2. Statistics and Actuarial Sciences

Faculty Members holding cross appointments to Systems Design Engineering from:
1. Optometry
2. University of Hull, United Kingdom
3. Management Sciences
4. Kinesiology
5. Environment and Resource Studies
6. Wilfrid Laurier University

*Also has Adjunct Appointment

Course Descriptions

Introductory Notes

1. The numbering of Systems Design Engineering courses is as follows:
   a. If the course is given in the "A" term, the number in the units place is odd; otherwise, it is even.
   b. The number in the 10's place refers to the field of the subject matter of the course, according to the following codes:
      1. topics in applied mathematics
      2. computer systems
      3. socio-economic systems
      4. human systems
      5. physical systems
      6. the design of engineering systems
      7. communication and information systems
      8. engineering sciences
      9. laboratories

   c. The number in the 100's place refers to the year in the program in which the student will encounter the course.

2. The majority of Systems Design courses are given on the basis of 3 formal lectures and 1 tutorial hour each week. The department endeavors to ensure that the formal course schedule remains below 30 hours per week in each term. Beyond this, other, less formally scheduled meetings between students and faculty are required. It is expected that the average student will spend, in total, between 45 and 55 hours per week on his/her studies.

SY DE 101/102 F,S 1C 0.0 Tutorial

SY DE 111 F 3C,1T 0.5 Calculus 1

SY DE 112 S 3C,1T 0.5 Calculus 2

SY DE 113 F 3C,1T 0.5 Linear Algebra

SY DE 121 F 3C,1T 0.5 Digital Computation
   Introduction to electronic digital computers; hardware and software organization, basic features of Pascal and/or Fortran, examples of efficient algorithms for engineering computation.

SY DE 122 S 3C,1T 0.5 Introduction to Computer Systems
   Binary variables and basic logic circuits; computer architecture and machine instructions for small computers; assembly language programming; interfacing with peripheral equipment; current engineering applications of microcomputers.

SY DE 131 F 3C,1T 0.5 Engineering Economics
   Cost-benefit analysis, critical path methods, interest, project economics, decision making, utility theory, project organizational theory.

SY DE 142 S 2C,2T 0.5 Introduction to Ergonomics
   The man-machine environment complex; the nature of the operational environment; human sensory processes, human information processing; motor function; human work, thermal regulation and metabolism, skill, fatigue; shift work and circadian rhythms, problems of acoustic noise, vibration, heat, cold; needs of ventilation and lighting, information displays and control systems.

SY DE 161 F 3C,3L 0.5 Introduction to Systems Design Engineering
   Introduction to the ideas and techniques of systems analysis and design. Fundamentals of graphic techniques. The use of graphics as an aid to idea generation in design. Principles of planning, innovation, creation of design solutions, feasibility analysis, solution evaluation and selection. The systems approach to value and utility.

SY DE 161 F 3C,1T 0.5 Statics

SY DE 182 S 3C,1T 0.5 Dynamics
**Course Descriptions**

**Systems Design Engineering**

**SY DE 104** S 2C,1T 0.5

*Introduction to Chemical Systems*

Concepts of electronic structure, bonding; shapes of molecules, especially in covalent molecules; reactivity, energetics, chemical behaviour as a consequence. Acidity, basicity and buffer solutions. Organic Chemistry - systems of nomenclature, functionality and common relations. Important systems of natural and synthetic polymers and biomolecules.

**SY DE 201/202** 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*

First order differential equations, integrating factor, higher order differential equations. Complex variables, forced and free solutions to differential equations, transient and steady state solutions, applications. Laplace transforms and applications.

**SY DE 212** F 3C,1T 0.5

*Applicable Mathematics for Systems Design 2*

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 transform; Fourier analysis, Laplace transform. Transfer functions and frequency response, frequency domain analysis of linear systems; sampling theory, stability, and linear filters.

**SY DE 213** W 3C,1T 0.5

*Theory and Applications of Probability*


**SY DE 214** F 3C,1T 0.5

*Theory and Applications of Statistics*


**SY DE 225** F 3C,1T 0.5

*Physical Systems 1*

Component models, interconnection models, systems equations and their rank properties and solutions. These concepts are developed with respect to electrical systems.

**SY DE 261** W 1C,3L 0.5

*Systems Design Workshop 1*

A problem and project oriented course wherein emphasis is placed on designing and presenting creative solutions to real-life problems. The problems are related to cover all disciplines. Both the problems and the student's work are expected to increase in sophistication through the Workshop course sequence.

**SY DE 262** F 1C,3L 0.5

*Systems Design Workshop 2*

A continuation of the Systems Design Workshop sequence.

**SY DE 281** W 3C,1T 0.5

*Mechanics of Deformable Solids*


**SY DE 283** W 3C,1T 0.5

*Electricity, Magnetism and Networks*

Introduction to the fundamental laws of electricity and magnetism; properties of dielectrics, conductors and semi-conductors and terminal characteristics of passive and active components; Kirchhoff's laws; step response of first and second order networks; sinusoidal steady state analysis using phasors. Applications.

**SY DE 284** W 3C,1T 0.5

*Fluid Mechanics*


**SY DE 292** F 2C,3L 0.5

*Digital Circuits and Systems Laboratory*

Digital systems design, an introduction to digital logic with emphasis on the use and characteristics of integrated circuits. Design of logic systems involving gates, counters, registers, flipflops and arithmetic logic units. An introduction to microprocessor components.

**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 311** S 3C,1T 0.5

*Introduction to Optimization*

Deterministic operations research models. Topics will include: mathematical techniques of unconstrained and constrained optimization, followed by the construction, evaluation and applicability of various models in allocation, inventory, replacement, sequencing and related problems.

**SY DE 321** S 3C,1T 0.5

*Numerical Analysis and Computer 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 322** W 3C,1T 0.5

*Computer Simulation of Systems*

System modelling, system simulation techniques, digital computer methods, fundamentals of analog and computation, digital simulation and analog computers, block-oriented languages, introduction to systems simulation using hybrid computers.

**SY DE 332** W 3C,1T 0.5

*Mathematical Programming*

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 333** S 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 361  S  2C,1L  0.5
Introduction to Occupational Hygiene
History and development of occupational hygiene. Review of organic chemical terminology. Recognition, evaluation, and control of, and human response to, hazardous chemical and physical agents in the environment.

SY DE 351  S  3C,1T  0.5
Physical Systems 2
The subject matter is similar to SY DE 252 except that the development is based on other physical systems such as mechanical and hydraulic systems. Mixed node, state formulation and solution. Relationship to classical approaches to modeling of systems from other physical systems.

SY DE 352  W  3C  0.5
Algorithms for Computer-Aided Systems Analysis
Techniques for tree selection, manipulation of topological information, evaluation of the exponential function of a matrix, etc. The emphasis is on the algorithms but students will be expected to implement them on the computers. A survey of the capabilities of existing programs for system analysis.

SY DE 353  S  3C,1T  0.5
Introduction to Linear Control Systems
Application of systems theory to the problems of control. The course integrates this study with an exposition of classical control theory.

SY DE 362  W  1C,3L  0.5
Systems Design Workshop 3
A continuation of the Systems Design Workshop sequence for third year students.

SY DE 364  W  3C,1T  0.5
Manufacturing Science

SY DE 366  W  2C,1T  0.5
Aesthetic and Perceptual Aspects of Design
Presentation and discussion of appropriate and possible methods for the designing of systems or artifacts in which aesthetic characteristics and visual form are primary requirements of the design.

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 394  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 microstructure; 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 391  S  2C,3L  0.5
Analog Circuits and Systems Laboratory
Analog systems design, signal conditioning systems, attenuation; amplification, oscillation, modulation and detection, linear filters. Input-output relationships, transfer functions and frequency response of linear systems. Application to measurement instrumentation.

SY DE 392  W  2C,3L  0.5
Control Systems Laboratory
This course serves as a focus for the complete lab program sequence. The emphasis is on major experiments which are themselves complete systems requiring the application of previous acquired knowledge in areas of sensing, synthesis, control, measurement and evaluation. Experiments are drawn from the digital control or computer control environment and from the analog control environment.

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 411  F  3C,1T  0.5
Probabilistic Modelling
A continuation of SY DE 311, with emphasis on stochastic operations research models. Topics will include: decision making under uncertainty, queuing models and related probabilistic techniques, feedback control, probabilistic inventory, competitive strategies and related topics.

SY DE 413  F  3C,1T  0.5
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 network and other network flow problems.

SY DE 421  F  3C,1T  0.5
Computer Aided Design
Issues and directions in computer aided design (CAD); fundamental principles and concepts required in design and building of CAD systems; architecture of CAD systems. The usefulness of areas such as knowledge based systems and expert systems will be discussed.

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
SY DE 432 W 3C, IT 0.5
Analysis of Large Systems
Topics include macroscopic modelling of large scale resource and societal systems, decomposition techniques, graph-theoretic and computer based methods of analysis, decision and control problems, other problems concerned with complexity, largeness and aggregation.

SY DE 433 F 3C 0.5
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.

SY DE 442 W 2C, IT 0.5
Occupational and Environmental Systems Safety

SY DE 443 F 2C, IT 0.5
Human Function
The structure and function of man in relation to the design of man-machine systems with specific emphasis on human physiology and bioengineering. The cell as micro-system and man as a complex of systems and sub-systems.

SY DE 453 F 3C 0.6
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 for solution.

SY DE 454 W 3C 0.5
Topics in Physical Systems Theory
This course applies physical systems theory to problems where the physical process is continuously distributed throughout a medium. The course contents include introduction to field and continuum problems; overview of approximate solution methods - including the finite difference method and the finite element method; identification of field variables; spatial discretization; modelling the field characteristics; formulations and computer solutions; applications of multi-terminal representations.

SY DE 458 W 3C, IT 0.5
Large Engineering Systems
Maximum Entropy Principle (MEP), Jayne’s formalism, applications to thermodynamics, derivation of some common probability distributions on the basis of MEP, spectral analysis and state estimation. The intent of the course is to spell out a systems methodology for probabilistic systems from an information-theoretic point of view.

SY DE 461 F 1C, 5L 0.5
Systems Design Workshop 4

SY DE 462 W 1C, IT 0.5
Systems Design Workshop 5
A continuation of the Systems Design Workshop sequence for fourth-year students.

SY DE 466 W 3C 0.5
Technological Innovation and its Management
Factors influencing technological innovation. The environment for technological innovation in Canada. Technological innovation in the corporations. The role of governments and universities, international comparisons.

SY DE 468 W 3C, IT 0.5
Structures and Design
Structural forms, Structural requirements. Statically determinate and indeterminate structures. Basic theorems of linear elastic structures. Methods of analysis: slope-deflection, moment distribution, etc. Applications of Graph Theory to the analysis of structural systems.

SY DE 472 W 2C, IT 0.5
Man-Machine Communications
The nature and design of machine-mediated human communication systems. Displays, computer graphics, computer-aided instruction and mass communication media (film, T.V., radio, print). A systems approach will be adopted with special attention to the socio-economic aspects of such systems.

SY DE 474 W 3C, IT 0.5
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.

SY DE 525 F 3C 0.5
Computer-Aided Simulation and Design
System modeling and simulation techniques, fundamentals of analog computation, time and magnitude scaling; continuous system simulation on the digital computer; advantages and disadvantages of digital and analog simulation techniques; discrete-event system simulation on the digital computer; system simulation; examples and problems.

SY DE 535 F 3C 0.5
Selected Topics for Socio-Economic Systems Design
This course is intended for students who, with little prior background, are interested in enlarging their knowledge of Systems Design. The emphasis is on the quantitative methods applicable to the design of engineering systems wherein the criteria concerning social, environmental and economic considerations are important. Both deterministic and probabilistic situations are discussed.

SY DE 543 W 3C 0.5
Human Engineering
Man-machine systems concepts; functional man-machine interfaces; presentation of required operating information; control/display design parameters; work-space configuration and dimensioning; human engineering analysis and simulation; human performance experimentation and human engineering measurements during systems R&D evaluation.

SY DE 544 F 3C 0.5
Ergonomics
Significance of ergonomics; man-machine-environment complex; physiology of work, human information processing, fatigue, circadian rhythms and the health consequences of shift work; environmental factors in industry; noise, vibration, vision, illumination, heat, cold, toxic chemicals, industrial safety.
Women's Studies

Women's Studies

Assistant Professor, Director of Women's Studies
L. Domey, BA, MA (Louisville)

Members of the Women's Studies Advisory Committee

Professors
P. Forsyth, AB (Mount Holyoke), MA, PhD (Toronto)
M.E. Thompson, BSc (Toronto), MSc, PhD (Illinois)

Associate Professors
P.E. Bowers, BA (Queen's), MA, PhD (Illinois)
G. Brude-Fimau, Staatssexamen (Berlin), PhD (Yale)
C.M. Fernandez, Lic en Arq (Madrid), MA (Tulane), D Lit et Phil (Madrid)
H.S. Founier, BA (Toronto), MA, PhD (Western Ontario)
V.F. Golini, BA (McMaster), MA (Colorado), PhD (California-Berkeley)
M.C. Howard, BA, MA (Lancaster), PhD (Leicester)
B. Hyma, BS, MS (Madras), MA (Sheffield), PhD (Pittsburgh)
S.K. Johannesen, BA (Evangel College), MA, PhD (Missouri)
J.A. Legault, BSc, MSc (Ottawa), PhD (Oklahoma), Chairperson of the Advisory Committee
R. Lister, BA, MA, PhD (Toronto)
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C.A. Peterson, BSc, MSc (Alberta), PhD (California, Davis)
N. Theberge, BA (Massachusetts), MA (Boston), PhD (Massachusetts)
A.F. Thompson, BA (Toronto), BTh (Huron), MA (Western Ontario), STM, PhD (McGill)
A. Wipper, BA, MA (McGill), PhD (California-Berkeley)

Assistant Professors
E. Kliman, MA, PhD (Toronto)
G.O. Michalenko, BA, PhD (Saskatchewan)
W.S. Mouil, BA, MA, PhD (British Columbia)
M. van Dijk, BA, MA (Wellington), PhD (Toronto)
A.C. Zeller, BSc (Trent), MA, PhD (Western Ontario)

Lecturers
S.P. Gunz, BA, LLB, MA (Sydney), MBA (Manchester)
R.L. Walker, BSc, MSc (Western Ontario)

Instructor
J. Lowe, BSc (Carleton), Recipient of the Distinguished Teacher Award

Dean of Students, Conrad Grebel College
G. Eby, BA (Goshen College)

Library
S. Bellingham, BA (Waterloo Lutheran), MLS (Western Ontario)

University of Waterloo
Since WS 200, the core course of the Joint Option, is an interdisciplinary introductory course to Women's Studies; this course is a team-taught effort. The participating lecturers from other disciplines of Art, Sociology, Psychology, Philosophy, Religious Studies, Economics, Political Science and English may vary each term.

Wilfrid Laurier University

Associate Professors
A. Guinsburg, BA (Valparaiso), AM, PhD (Stanford)

Course Descriptions

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.

W S 300
Seminar in Women's Studies
A seminar in which students will examine the origins and course of the women's movement from an interdisciplinary perspective, with special attention to topics such as the Canadian woman.

Women's Studies core courses and approved courses are listed in the Interdisciplinary Options, Chapter 15.
Governing Bodies and Staff
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
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Vice-Chairman, J. Bergsma
Secretary, J.W. Brown

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President, D.T. Wright
Mayor of the City of Waterloo, M. Carroll
Mayor of the City of Kitchener, D.V.P. Cardillo
Regional Chairman, K. Seiling

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J. Bergsma, Burlington
G.F.S. Clarke, Toronto
W. Dobson, Toronto
J.T. Eyton, Toronto
K.A. Gustaitis, Toronto
D.G. MacLeod, Cambridge
J.A. Pollock, Kitchener
A. Sarlos, Toronto
J.E. Sinclair, Ottawa

Appointed by the Lieutenant-Governor-In-Council
T.A. Eagan, Toronto
F.F. Gaskin, Cambridge
D.H. Haberstroh, Kitchener
W.F. McCormick, Cambridge
M. Omand, Waterloo
A. Reitzel, Waterloo
P.H. Sims, Kitchener

Staff
H. Hahn
R.L. Knight

Governing Bodies
Board of Governors
Senate

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R.A. George
A. Kerr-Lawson
M. MacDonald
W.U. Ober
P.H. Roe
G.N. Soulis

Undergraduate Students
I. Mitchell
S. Forrest
B. Fortune

Graduate Students
M. Webster
P. Van Oorschot

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 committees include Senate Undergraduate Council, Senate Scholarships and Student Aid Committee and Senate Long Range Planning Committee.

Officers
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Vice-Chairman, T.A. Brzustowski, BASc, AM, PhD, PEng
Secretary, J.W. Brown, BA

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President, D.T. Wright, BASc, MS, PhD, DEng, LLB, DSc, LHD, PEng
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Vice-President, University Services, D.P. Robertson, BComm
Treasurer, J.G. Robb, CGA
Librarian, M.C. Shepherd, BEd, MA(LS)
Registrar, C.T. Boyes, BA
President, Federation of Students, S. Forrest
President, Graduate Association, M. Webster, BA, MA
The Principal or President of each Federated or Affiliated College

N.L. Choate, CR, BA, MA (President, St. Jerome's)
R. Lebold, BA, BD, MTh, DMin (President, Conrad Grebel)
I.L. Campbell, BA, MSc (Principal, Renison)
F.C. Gérard, MA, BD, STM, PhD (Principal, St. Paul's)

The Dean of each Faculty
R.K. Banks, BA, MA, PhD (Arts)
W.C. Lennox, BASc, MSc, PhD, PEng (Engineering)
J.H. Bater, BA, MA, PhD (Environmental Studies)
R.G. Marteniuk, BPE, MA, EdD (Human Kinetics and Leisure Studies)
J.G. Kalbfleisch, BSc, MA, PhD (Mathematics)
D.E. Brodie, BSc, MSc, PhD (Science)

The Dean of Graduate Studies
L.A.K. Watt, BSc, MS, PhD (Acting Dean)

The Dean of Computing and Communications
J.W. Graham, BA, MA

Elected Members

Faculty Representatives

To 1987
P. Forsyth, AB, MA, PhD (Arts)
G.M. Bragg, BASc, PhD, PEng (Engineering)
E. Bunting, BA, MA, PhD (Environmental Studies)
D.E. Mills, BSAG, PhD (Human Kinetics and Leisure Studies)
F.A. Zorzitto, BSc, PhD (Mathematics)
R.J. LeRoy, BSc, MSc, PhD (Science)
J. Theis, BA, MA (St. Jerome's College)
M. Smyth, BA, MA, PhD (Renison College)
E.J. Ashworth, BA, MA, PhD (At large)
G.N. Soulis, BASc, PEng (At large)
W.D. Wilson, MA, PhD (At large)
D. Kubat, MA, PhD (At large)
D.G. John, BA, MA, PhD (At large)

To 1988
L.G. Eckel, BA, BComm, MBA, PhD, CA, FCA (Arts)
P.H. Roe, BASc, MASc, PhD, PEng (Engineering)
R.S. Dorney, BSc, MSc, PhD, MCP (Environmental Studies)
I.D. Williams, MS, PhD (Human Kinetics and Leisure Studies)
J. Cizek, RNDr, CSC (Mathematics)
K.A. Woolner, BSc (Science)
G.C. Andrews, BASc, MASc, PhD, PEng (At large)
G.F. Atkinson, MA, PhD, CChem, FRSC (UK), FCI (At large)
J.A. Brzozowski, BSc, MASc, PhD (At large)
A. Kerr-Lawson, BA, MA, PhD (At large)
I.J. McGee, BASc, MSc, PhD (At large)
W.U. Ober, BA, PhD (At large)
M. Vogel-Sprott, BA, MA, PhD (At large)
G.C. Woo, OD, MS, PhD, LOSc, FAAA, DipLV (At large)

Student Representatives

To 1987
Undergraduate
R. Goodwin (Engineering)
S. King (Human Kinetics and Leisure Studies)
B. Fortune (Mathematics)
D. Leis (At large)

Graduate
G.S. Holman, MMath
P.A. Layman, MASc

To 1988
Undergraduate
I. Mitchell (Arts)
A. Chamberlain (Environmental Studies/Independent Studies)
B. Burow (Science)
D. Janssen (At large)

Graduate
J. Jenness, MASc
P. Van Oorschot, MMath

Alumni Representatives

To 1987
M.F. Garvey, BA, FCA

To 1988
R. MacDonald, BA

To 1989
W. Schneider, BASc
Board of Governors Representatives
To 1987
vacancy
To 1988
vacancy
To 1989
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 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
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President Emeritus
J.G. Hagey, OC, BA, LL.D

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Associate University Secretary
R.J. Bullen, BMath
Associate University Secretary
D.P. Scheifele
Assistant University Secretary

Internal Audit
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Director

Security
F.R. Stewart
Consultant

Vice-President, Academic
T.A. Brzustowski, BASc, AM, PhD, PEng

Advisors to the Vice-President, Academic
To be announced
Advisor on Research
J.S. Gardner, BSc, MSc, PhD
Advisor on Interdisciplinary Programs
D.A. Brisbin, BSc, PhD
Advisor on Academic Human Resources

Faculty of Arts
R.K. Banks, BA, MA, PhD
Dean of Arts
G.A. Griffin, BA, MA, PhD
Associate Dean, Undergraduate Affairs, and Associate Dean for Computing
R.A. George, MA, PhD
Associate Dean, Graduate Affairs
D.G. John, BA, MA, PhD
Associate Dean, Special Programs
J.F. Wills, BA
Secretary and Administrative Officer
R.L. Knight, AB
Arts Academic Counsellor
I. Mackay, BSc, MSc
Co-ordinator, Mature Student Services

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Associate Dean, Undergraduate Studies
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Associate Dean, Graduate Studies and Research
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J.D. Weller, BA, FCA
Executive Assistant to the Dean

Faculty of Environmental Studies
J.H. Bater, BA, MA, PhD
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G.R. McBoyle, BSc, PhD
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R.T. Newkirk, BA, MSc, PhD
Associate Dean Computing & Communications
J.M. Holzinger
Administrative Assistant to the Dean
N. Smale, BA, MAsc
Environmental Studies Counsellor
Faculty of Human Kinetics and Leisure Studies
R.G. Marteniuk, BPE, MA EdD
   Dean of Human Kinetics and Leisure Studies
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   Associate Dean, Undergraduate Affairs
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   Associate Dean, Graduate Affairs
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   Associate Dean, Computer Applications and Special Projects
J.D. Carter, BA, CGA
   Executive Assistant to the Dean

Faculty of Mathematics
J.G. Kalbfleisch, BSc, MA, PhD
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   Director, Mathematics Faculty Computing Facility
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   Administrative Assistant to the Dean

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A.I. Dagg, BA, MA, PhD
   Academic Director

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   Acting Dean of Graduate Studies
H. Kilbride, BA
   Associate Registrar, Graduate Studies

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   Associate Dean of Computing and Communications

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S. Bellingham, BA, MLS  
Special Collections Librarian  
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Co-ordinator, Library Administrative Services

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Assistant Registrar, Mathematics, Science  
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Assistant Registrar, Human Kinetics and Leisure Studies, and Continuing Education Liaison Officer  
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Assistant Registrar, Scheduling  
G.V. Ambrose  
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C.N. Sochaskey  
Manager, Correspondence Course Offerings

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Dean of Students
E.S. Lucy, BA
  Dean

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C.A.W. Totzke, BA
  Director

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Z. Whittington
  Bookings Agent

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  Manager

Centre for the Arts
D.S. Donaldson, BMus
  Manager

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  Director

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S. Minas, BA, MA
L. Thom, MA
R.J. Walsh, BA, MASc
J.J. Wine, AB, MSc, PhD

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  Director

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  Medical Director
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  Supervisor
N. Ozaruk, CRSP
  Safety Director
A. Ledbetter, MSW
  Counsellor
S. Chris, PhD
  Counsellor
F. Thomilson
  Co-ordinator, Disabled Services

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  Warden of Residence and
  Director of Housing

Plant Operations
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  Director

Treasurer
J.G. Robb, CGA

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  Director
W.P. McNamara, RIA
  Associate Director
J.S. Phillips, MCI
  Manager, Accounts Receivable and Credit
E. Dodds (Bookstore)
  Director
C.A. Lawrence (Central Stores and Mail Services)
  Director
D.A. Gardener (Purchasing)
  Director

Office of Operations Analysis
R.D. Truman, BMath
  Director

Office of Budgets
J. Manson, CA
  Director

University Club
J. Staines
  Manager

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Date Conferred
Dorothea Walter, BA, MA
  May 1972
Paul Meincke, BSc, PEng
  May 1985
Hildegard Marsden, BA, MA
  October 1985
William G. Scott, BA, MA
  May 1986

Professors Emeritus
Date Conferred
Paul Seligman, BA, PhD
  Philosophy
  May 1975
H.B. Noel Hynes, PhD, DSc, ARCS, FRSC
  Biology
  May 1983
George R. Hibbard, BA, MA
  English
  October 1985
William B. Pearson, DFC, MA, DSc, FRSC, FCIC
  Chemistry, Physics
  May 1986
William T. Tutte, BA, MA, PhD, FRSC
  Combinatorics and Optimization
  May 1986
Edward J. Fisher, BA, MA, DSc, FAAO
  Optometry
  May 1987
W.A.E. (Pete) McBryde, MA, PhD, FCIC
  Chemistry
  May 1987

*Deceased
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's WATFUND. The President's Committee members play an important role in the development of the University, not only directly through their contributions to the WATFUND, but indirectly through the example they set for Corporations and Foundations which are approached to support the University.

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- G.R. Baksi, Kitchener
- J.S. Dellandrea, Waterloo
- J.P. Duffy, Waterloo
- J.W. Dyck, Waterloo
- S.A. Feraday, Toronto
- M.F. Garvey, Toronto
- J.R. Hanna, Waterloo
- C.B. Hilliker, Waterloo
- J.R. Hanna, Waterloo
- B.G. Higgins, Waterloo
- B.G. Hutchinson, Waterloo
- R.G.R. Lawrence, Waterloo
- D.B. Livingston, Waterloo
- J.P. Logan, Toronto
- R.P. MacDonald, Waterloo
- Hon. A.G. MacKinnon, New Westminster
- D.B. MacKinnon, Vancouver
- B.C. Matthews, Waterloo
- L. Matthews, Waterloo
- N.W. McLeod, Westhill
- D.H. Moogk, Kitchener
- J.C. Pavanel, Waterloo
- D.D. Roberts, Waterloo
- J.E. Robinson, Toronto
- A. Saros, Toronto
- R. Sexton, Hull
- K. Shantz, Kitchener
- W. Shantz, Kitchener
- H.D. Sharma, Waterloo
- A.M. Shouits, Qualicum Beach
- L.W. Smith, Kitchener
- G.R. Sullivan, Waterloo
- M.C. Volker, Waterloo

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- M.J. Abs, Barrie
- J.D. Aczel, Waterloo
- F.A. Allard, Waterloo
- G.V. Ambrose, Kitchener
- J.E. Arbuttle, Kitchener
- H.M. Armitage, Waterloo
- E.J. Ashworth, Waterloo
- E.M. Avedon, Waterloo
- D.T. Ayer, Kitchener
- R.K. Banks, Waterloo
- J.D. Barrington, Willowdale
- T.J. Bata, Don Mills
- J.H. Bater, Waterloo
- T.L. Batke, Vancouver
- M. Beam, Waterloo
- R.E. Beam, Toronto
- C.F.A. Beaumont, Waterloo
- J. Bergsma, Burlington
- M.S. Bird, Kitchener
- C. Bonza, Valley Forge
- L.R. Bricker, Waterloo
- D.A. Brisbin, Kitchener
- D.E. Brodie, St. Agatha
- C.R. Bronfman, Montreal
- E. Bronfman, Toronto
- P. Bronfman, Toronto
- J.W. Brown, Waterloo
- M.P. Brydon, Waterloo
- J.A. Brzoowski, Waterloo
- T.A. Brzustowski, Kitchener
- I.L. Campbell, Waterloo
- J.B. Capendale, Waterloo
- M.E. Carroll, Waterloo
- Rev. N.L. Choate, C.R., Waterloo
- G.F.S. Clarke, Toronto
- H.D. Clemens, St. Catharines
- W.B. Clemens, St. Catharines
- D.H. Copp, Elora
- E.B. Cross, Waterloo
- D. Crowne, Waterloo
- L.A. Cummings, Kitchener
- I.R. Dagg, Waterloo
- D.A. Davies, Waterloo
- G. De Gré, Waterloo
- D.W. Desauteliers, Belleville
- D. Dixon, Kitchener
- R. Dixon, Kitchener
- E. Dods, Kitchener
- R.G.H. Downer, Waterloo
- R.R. Dubinski, Waterloo
- J.J. Dubuc, Cornwall
- J. Dufault, Toronto
- M. Dumancic, Waterloo
- R.G. Dunkley, Kitchener
- A.I. Dust, Waterloo
- P.C. Eastman, Waterloo
- H.K. Ellett, Waterloo
- R.F. Elliott, Toronto
- M. Erickson, Waterloo
- S. Evers, Guelph
- E.V. Eves, Burlington
- H.R.N. Eyd, Waterloo
- J.T. Eyton, Toronto
- T.Z. Fahid, Kitchener
- R.N. Farvoelden, Kitchener
- E.J. Fisher, Waterloo
- M.P. Fitzgerald, Waterloo
- S. Forrest, Waterloo
- P.Y. Forsyth, Waterloo
- G.R. Francis, Waterloo
- R.J. Friesen, Waterloo
- P. Fritz, Waterloo
- P. Fryer, Waterloo
- F.F. Gaskin, Cambridge
- A.B. Gellatly, Vancouver
<table>
<thead>
<tr>
<th>Name</th>
<th>City</th>
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<tbody>
<tr>
<td>R.H. Sims</td>
<td>Waterloo</td>
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<td>G.E. Slethaug</td>
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<td>H.J. Smith</td>
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<td>P.H. Smith, Jr.</td>
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<td>S.M. Smith, St. Agatha</td>
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<td>G.C. Spaetzl</td>
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<td>A.E. Stedelbauer</td>
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<td>J. Stubbs</td>
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<td>D.S. Sykes</td>
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<td>New Hamburg</td>
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<td>C.A.W. Totzke</td>
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<td>G. Tunks, London</td>
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<td>W.T. Tutte</td>
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<td>E.M. Twardus</td>
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<td>G.A. Ujjimoto</td>
<td>Salmon Arm</td>
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<td>J.W. Van Evra</td>
<td>Kitchener</td>
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<td>H. Veitch</td>
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Membership as of December 31, 1962
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