University of Waterloo
Undergraduate Calendar
1981-1982
The Undergraduate Calendar

The information in this Calendar applies to the 1981-82 academic session which commences in September 1981.

The University of Waterloo publishes:

* An Undergraduate Calendar
  A Graduate Studies Calendar
* A booklet on Federated and Affiliated Church Colleges
  A Correspondence Programme Calendar
  A Part-time Studies Calendar
* An Integrated Studies booklet

And booklets on the following Faculties:

* Faculty of Arts
* Faculty of Engineering
* Faculty of Environmental Studies
* Faculty of Human Kinetics and Leisure Studies
* Faculty of Mathematics
* Faculty of Science

Those marked * would normally appear in the WATBOX

All courses listed in the Undergraduate Calendar may not be offered in the current session. To be assured of complete information for Pre-registration, students must consult the University Course Offerings List as well as the Calendar before arranging their programmes.

Course Descriptions in the Undergraduate Calendar are accurate as to intention at the time of writing, but the actual content may vary somewhat when the course is presented.

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

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
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
# Undergraduate Calendar 1981-82

## Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glossary of Terms</td>
<td>4</td>
</tr>
<tr>
<td>Academic Calendar</td>
<td>5</td>
</tr>
<tr>
<td>Campus Guide and Legend</td>
<td>11</td>
</tr>
<tr>
<td>Routes to UW Campus</td>
<td>12</td>
</tr>
</tbody>
</table>

## General Information

<table>
<thead>
<tr>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>University of Waterloo</td>
<td>14</td>
</tr>
<tr>
<td>Admissions</td>
<td>26</td>
</tr>
<tr>
<td>Fees and Registration</td>
<td>36</td>
</tr>
<tr>
<td>Scholarships, Bursaries, Prizes and Financial Aid</td>
<td>44</td>
</tr>
<tr>
<td>Department of Co-ordination and Placement</td>
<td>60</td>
</tr>
<tr>
<td>The University Libraries</td>
<td>76</td>
</tr>
</tbody>
</table>

## Undergraduate Programmes

<table>
<thead>
<tr>
<th>Programme</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Faculty of Arts</td>
<td>80</td>
</tr>
<tr>
<td>Programme in Canadian Studies</td>
<td>124</td>
</tr>
<tr>
<td>Faculty of Engineering</td>
<td>126</td>
</tr>
<tr>
<td>Faculty of Environmental Studies</td>
<td>150</td>
</tr>
<tr>
<td>Faculty of Human Kinetics and Leisure Studies</td>
<td>178</td>
</tr>
<tr>
<td>Programme of Integrated Studies</td>
<td>190</td>
</tr>
<tr>
<td>Faculty of Mathematics</td>
<td>194</td>
</tr>
<tr>
<td>Faculty of Science</td>
<td>216</td>
</tr>
</tbody>
</table>

## Undergraduate Course Descriptions

<table>
<thead>
<tr>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 248</td>
<td></td>
</tr>
</tbody>
</table>

## Governing Bodies and Staff

<table>
<thead>
<tr>
<th>Bodies</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>16 492</td>
<td></td>
</tr>
</tbody>
</table>

## Index

<table>
<thead>
<tr>
<th>Index</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>17 498</td>
<td></td>
</tr>
</tbody>
</table>
Glossary of Terms

Antirequisites
Courses with significant overlap. Degree credit cannot be obtained for both the antirequisite and the course naming it.

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 programme earned toward a degree. A credit weight of 1.0 is normally assigned to a 26 week (2 term) course; a credit weight of 0.5 is normally assigned to a 13 week (1 term) course. These credit weights are used in the calculation of averages for academic standing. Most courses have credit weights of 0.5 or 1.0, but some have other weights such as 0.25, 0.75, 2.0.

Cross-Listed Courses
Courses which are listed under two departments and which can be taken as a 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 one or more courses at another university to be used for credit toward the University of Waterloo degree.

Minor
A group of approved courses taken by an honours student in a subject outside his/her "major" area. Minor is often defined differently by other institutions. Students should be sure that they meet the requirements set out by other institutions they may wish to attend.

Option
A specified combination of grouping of courses which provides a secondary emphasis in certain programmes. 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).

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

Prerequisite
A course required to be taken 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.)

Programme
A series of courses, a number of which may be mandatory and of a specialized nature, which lead toward a degree. Details of the several types of programmes offered such as Honours, General, Pass, Pre-Professional, Professional are given in the Calendar.

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.

Session
Refers to the eight month (26 week) period of registration for programmes and courses extending from September to April. Also used in reference to the six week summer session held in July and August.

Term
Refers to a particular four-month (13 week) period of 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 which occur in the above time periods.
# Academic Calendar 1981

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
<th>Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meeting - Senate Executive Committee</td>
<td>March 2</td>
<td>Monday</td>
</tr>
<tr>
<td>Supplemental Examinations Begin - Co-operative Programmes</td>
<td>March 2</td>
<td>Monday</td>
</tr>
<tr>
<td>Pre-registration Begins - Regular and Co-operative Students for Fall Term 1981</td>
<td>March 2</td>
<td>Monday</td>
</tr>
<tr>
<td>Pre-registration Ends - Regular and Co-operative Students for Fall Term 1981</td>
<td>March 6</td>
<td>Friday</td>
</tr>
<tr>
<td>Meeting - University Senate, 7:30 p.m.</td>
<td>March 16</td>
<td>Monday</td>
</tr>
<tr>
<td>Lectures End - Winter Term</td>
<td>March 31</td>
<td>Tuesday</td>
</tr>
<tr>
<td>Examinations Begin - Winter Term</td>
<td>April 4</td>
<td>Saturday</td>
</tr>
<tr>
<td>Meeting - Senate Executive Committee</td>
<td>April 6</td>
<td>Monday</td>
</tr>
<tr>
<td>Meeting - Board of Governors, 10:00 a.m.</td>
<td>April 7</td>
<td>Tuesday</td>
</tr>
<tr>
<td>Good Friday - University Holiday*</td>
<td>April 17</td>
<td>Friday</td>
</tr>
<tr>
<td>Meeting - University Senate, 7:30 p.m.</td>
<td>April 20</td>
<td>Monday</td>
</tr>
<tr>
<td>Examinations End - Winter Term</td>
<td>April 24</td>
<td>Friday</td>
</tr>
<tr>
<td>Winter Work Term Ends - Co-operative Programmes</td>
<td>April 24</td>
<td>Friday</td>
</tr>
<tr>
<td>Spring Work Term Begins - Co-operative Programmes</td>
<td>April 27</td>
<td>Monday</td>
</tr>
<tr>
<td>Final Examination Results Due</td>
<td>May 1</td>
<td>Friday</td>
</tr>
<tr>
<td>Registration - Undergraduate Co-operative Programmes</td>
<td>May 4</td>
<td>Monday</td>
</tr>
<tr>
<td>Registration - Graduate Studies - Spring Term</td>
<td>May 4</td>
<td>Monday</td>
</tr>
<tr>
<td>Lectures Begin - Spring Term</td>
<td>May 4</td>
<td>Monday</td>
</tr>
<tr>
<td>Meeting - Senate Executive Committee</td>
<td>May 5</td>
<td>Tuesday</td>
</tr>
<tr>
<td>Start of Late Fees - Spring Term</td>
<td>May 5</td>
<td>Tuesday</td>
</tr>
<tr>
<td>Victoria Day - University Holiday*</td>
<td>May 18</td>
<td>Monday</td>
</tr>
<tr>
<td>Meeting - University Senate, 7:30 p.m.</td>
<td>May 19</td>
<td>Tuesday</td>
</tr>
<tr>
<td>Spring Convocation</td>
<td>May 28</td>
<td>Thursday</td>
</tr>
<tr>
<td>Spring Convocation</td>
<td>May 29</td>
<td>Friday</td>
</tr>
<tr>
<td>Spring Convocation</td>
<td>May 30</td>
<td>Saturday</td>
</tr>
<tr>
<td>Meeting - Senate Executive Committee</td>
<td>June 1</td>
<td>Monday</td>
</tr>
<tr>
<td>Meeting - Board of Governors, 10:00 a.m.</td>
<td>June 2</td>
<td>Tuesday</td>
</tr>
<tr>
<td>Pre-registration Begins - Co-operative Students for Winter Term 1982</td>
<td>June 3</td>
<td>Wednesday</td>
</tr>
<tr>
<td>Pre-registration Ends - Co-operative Students for Winter Term 1982</td>
<td>June 5</td>
<td>Friday</td>
</tr>
<tr>
<td>Meeting - University Senate, 7:30 p.m.</td>
<td>June 15</td>
<td>Monday</td>
</tr>
<tr>
<td>Last Date to Register - Spring Term</td>
<td>June 30</td>
<td>Tuesday</td>
</tr>
<tr>
<td>Dominion Day - University Holiday*</td>
<td>July 1</td>
<td>Wednesday</td>
</tr>
<tr>
<td>Supplemental Examinations Begin (Architecture)</td>
<td>July 6</td>
<td>Monday</td>
</tr>
<tr>
<td>Registration - Summer Session</td>
<td>July 6</td>
<td>Monday</td>
</tr>
<tr>
<td>Lectures Begin - Summer Session</td>
<td>July 6</td>
<td>Monday</td>
</tr>
<tr>
<td>Start of Late Fees - Summer Session</td>
<td>July 7</td>
<td>Tuesday</td>
</tr>
<tr>
<td>Lectures End - Spring Term</td>
<td>July 29</td>
<td>Wednesday</td>
</tr>
<tr>
<td>Last Date to Register - Summer Session</td>
<td>July 30</td>
<td>Thursday</td>
</tr>
</tbody>
</table>

*Some university departments may be open for limited service on these days.*
### Academic Calendar

#### 1981 Continued

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examinations Begin - Spring Term</td>
<td>August 1</td>
</tr>
<tr>
<td>Civic Holiday - University Holiday*</td>
<td>August 3</td>
</tr>
<tr>
<td>Examinations End - Spring Term</td>
<td>August 13</td>
</tr>
<tr>
<td>Lectures End - Summer Session</td>
<td>August 14</td>
</tr>
<tr>
<td>Examinations - Summer Session</td>
<td>August 15</td>
</tr>
<tr>
<td>Final Examination Results Due</td>
<td>August 20</td>
</tr>
<tr>
<td>Spring Work Term Ends - Co-operative Programmes</td>
<td>August 21</td>
</tr>
<tr>
<td>Fall Work Term Begins - Co-operative Programmes</td>
<td>August 24</td>
</tr>
</tbody>
</table>

**Labour Day - University Holiday*** |
| Registration Begins - Undergraduate Regular and Co-operative Programme | September 7 |
| Meeting - Senate Executive Committee | September 8 |
| Registration - Graduate Studies - Fall Term | September 11 |
| Registration Ends - Undergraduate Regular and Co-operative Programmes | September 11 |
| Lectures Begin - Fall Term | September 14 |
| Start of Late Fees - Fall Term | September 14 |
| Meeting - University Senate, 7:30 p.m. | September 14 |
| End of Course Change Period - Fall Term | September 21 |

**Meeting - Senate Executive Committee | October 5**
**Meeting - Board of Governors, 10:00 a.m. | October 6**
**Thanksgiving Day - University Holiday*** | October 12 |
**Meeting - University Senate, 7:30 p.m. | October 19**
**Fall Convocation | October 23**
**Application Deadline, Correspondence - Winter Term | October 26**
**Supplemental Examinations Begin (Architecture) | October 26**
**Last Date to Register - Fall Term | October 26**

**Meeting - Senate Executive Committee | November 2**
**Pre-registration Begins - On-Campus Co-operative Students for Spring Term 1982 | November 4**
**Pre-registration Ends - On-Campus Co-operative Students for Spring Term 1982 | November 6**
**Meeting - University Senate, 7:30 p.m. | November 16**

**Meeting - Senate Executive Committee | December 1**
**Lectures End - Fall Term | December 8**
**Examinations Begin - Fall Term | December 10**
**Meeting - University Senate, 7:30 p.m. | December 21**
**Examinations Ends - Fall Term | December 23**
**Fall Work Term Ends | December 24**
**Winter Work Term Begins | December 28**
**Christmas Holidays*** |

*Some university departments may be open for limited service on these days.*
### Academic Calendar

#### 1982

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
<th>Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Year's Day – University Holiday*</td>
<td>January 1</td>
<td>Friday</td>
</tr>
<tr>
<td>Registration – Undergraduate Co-operative and</td>
<td>January 4</td>
<td>Monday</td>
</tr>
<tr>
<td>Regular Programmes – Winter Term</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Final Examination Results Due</td>
<td>January 4</td>
<td>Monday</td>
</tr>
<tr>
<td>Registration – Graduate Studies – Winter Term</td>
<td>January 4</td>
<td>Monday</td>
</tr>
<tr>
<td>Lectures Begin – Winter Term</td>
<td>January 4</td>
<td>Monday</td>
</tr>
<tr>
<td>Meeting – Senate Executive Committee</td>
<td>January 4</td>
<td>Monday</td>
</tr>
<tr>
<td>Start of Late Fees – Winter Term</td>
<td>January 5</td>
<td>Tuesday</td>
</tr>
<tr>
<td>Meeting – University Senate, 7:30 p.m.</td>
<td>January 18</td>
<td>Monday</td>
</tr>
<tr>
<td>End of Course Change Period – Winter Term</td>
<td>January 22</td>
<td>Friday</td>
</tr>
<tr>
<td>Last Date to Register – Winter Term</td>
<td>January 29</td>
<td>Friday</td>
</tr>
<tr>
<td>Meeting – Senate Executive Committee</td>
<td>February 1</td>
<td>Monday</td>
</tr>
<tr>
<td>Meeting – Board of Governors, 10:00 a.m.</td>
<td>February 2</td>
<td>Tuesday</td>
</tr>
<tr>
<td>Meeting – University Senate, 7:30 p.m.</td>
<td>February 15</td>
<td>Monday</td>
</tr>
<tr>
<td>Study Week Begins – Arts &amp; Environmental Studies (Regular Programmes)</td>
<td>February 15</td>
<td>Monday</td>
</tr>
<tr>
<td>Application Deadline, Correspondence – Spring Term</td>
<td>February 19</td>
<td>Friday</td>
</tr>
<tr>
<td>Meeting – Senate Executive Committee</td>
<td>March 1</td>
<td>Monday</td>
</tr>
<tr>
<td>Supplemental Examinations Begin (Architecture)</td>
<td>March 1</td>
<td>Monday</td>
</tr>
<tr>
<td>Pre-registration Begins – Regular and Co-operative Students for Fall Term 1981</td>
<td>March 1</td>
<td>Monday</td>
</tr>
<tr>
<td>Pre-registration Ends – Regular and Co-operative Students for Fall Term 1981</td>
<td>March 5</td>
<td>Friday</td>
</tr>
<tr>
<td>Meeting – University Senate, 7:30 p.m.</td>
<td>March 15</td>
<td>Monday</td>
</tr>
<tr>
<td>Lectures End – Winter Term</td>
<td>March 30</td>
<td>Tuesday</td>
</tr>
<tr>
<td>Examinations Begin – Winter Term</td>
<td>April 3</td>
<td>Saturday</td>
</tr>
<tr>
<td>Meeting – Senate Executive Committee</td>
<td>April 5</td>
<td>Monday</td>
</tr>
<tr>
<td>Meeting – Board of Governors, 10:00 a.m.</td>
<td>April 6</td>
<td>Tuesday</td>
</tr>
<tr>
<td>Good Friday – University Holiday*</td>
<td>April 9</td>
<td>Friday</td>
</tr>
<tr>
<td>Meeting – University Senate, 7:30 p.m.</td>
<td>April 19</td>
<td>Monday</td>
</tr>
<tr>
<td>Examinations End – Winter Term</td>
<td>April 23</td>
<td>Friday</td>
</tr>
<tr>
<td>Winter Work Term Ends – Co-operative Programmes</td>
<td>April 30</td>
<td>Friday</td>
</tr>
<tr>
<td>Final Examination Results Due</td>
<td>April 30</td>
<td>Friday</td>
</tr>
<tr>
<td>Spring Work Term Begins – Co-operative Programmes</td>
<td>May 3</td>
<td>Monday</td>
</tr>
<tr>
<td>Registration – Undergraduate Co-operative Programmes</td>
<td>May 3</td>
<td>Monday</td>
</tr>
<tr>
<td>Registration – Graduate Studies – Spring Term</td>
<td>May 3</td>
<td>Monday</td>
</tr>
<tr>
<td>Lectures Begin – Spring Term</td>
<td>May 3</td>
<td>Monday</td>
</tr>
<tr>
<td>Meeting – Senate Executive Committee</td>
<td>May 3</td>
<td>Monday</td>
</tr>
<tr>
<td>Start of Late Fees – Spring Term</td>
<td>May 4</td>
<td>Tuesday</td>
</tr>
<tr>
<td>End of Course Change Period – Spring Term – Individual Faculty Chapters should be consulted</td>
<td>May 17</td>
<td>Tuesday</td>
</tr>
<tr>
<td>Meeting – University Senate, 7:30 p.m.</td>
<td>May 24</td>
<td>Monday</td>
</tr>
<tr>
<td>Victoria Day – University Holiday*</td>
<td>May 27</td>
<td>Thursday</td>
</tr>
<tr>
<td>Spring Convocation</td>
<td>May 28</td>
<td>Friday</td>
</tr>
<tr>
<td>Spring Convocation</td>
<td>May 29</td>
<td>Saturday</td>
</tr>
</tbody>
</table>

*Some university departments may be open for limited service on these days.*
1982 Continued

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
<th>Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meeting - Board of Governors, 10:00 a.m.</td>
<td>June 1</td>
<td>Tuesday</td>
</tr>
<tr>
<td>Pre-registration Begins - Co-operative Students for</td>
<td>June 2</td>
<td>Wednesday</td>
</tr>
<tr>
<td>Winter Term 1982</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-registration Ends - Co-operative Students for</td>
<td>June 4</td>
<td>Friday</td>
</tr>
<tr>
<td>Winter Term 1982</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meeting - Senate Executive Committee</td>
<td>June 7</td>
<td>Monday</td>
</tr>
<tr>
<td>Meeting - University Senate 7:30 p.m.</td>
<td>June 21</td>
<td>Monday</td>
</tr>
<tr>
<td>Last Date to Register - Spring Term</td>
<td>June 30</td>
<td>Wednesday</td>
</tr>
<tr>
<td>Dominion Day - University Holiday*</td>
<td>July 1</td>
<td>Thursday</td>
</tr>
<tr>
<td>University Holiday*</td>
<td>July 2</td>
<td>Friday</td>
</tr>
<tr>
<td>Supplemental Examinations Begin (Architecture)</td>
<td>July 5</td>
<td>Monday</td>
</tr>
<tr>
<td>Registration - Summer Session</td>
<td>July 5</td>
<td>Monday</td>
</tr>
<tr>
<td>Lectures Begin - Summer Session</td>
<td>July 5</td>
<td>Monday</td>
</tr>
<tr>
<td>Start of Late Fees - Summer Session</td>
<td>July 6</td>
<td>Tuesday</td>
</tr>
<tr>
<td>Lectures End - Spring Term</td>
<td>July 28</td>
<td>Wednesday</td>
</tr>
<tr>
<td>Last Date to Register - Summer Session</td>
<td>July 29</td>
<td>Thursday</td>
</tr>
<tr>
<td>Examinations Begin - Spring Term</td>
<td>July 31</td>
<td>Saturday</td>
</tr>
<tr>
<td>Civic Holiday - University Holiday*</td>
<td>August 2</td>
<td>Monday</td>
</tr>
<tr>
<td>Examinations End - Spring Term</td>
<td>August 12</td>
<td>Thursday</td>
</tr>
<tr>
<td>Lectures End - Summer Session</td>
<td>August 13</td>
<td>Friday</td>
</tr>
<tr>
<td>Examinations - Summer Session</td>
<td>August 14</td>
<td>Saturday</td>
</tr>
<tr>
<td>Final Examination Results Due</td>
<td>August 19</td>
<td>Thursday</td>
</tr>
<tr>
<td>Spring Work Term Ends - Co-operative Programmes</td>
<td>August 27</td>
<td>Friday</td>
</tr>
<tr>
<td>Fall Work Term Begins - Co-operative Programmes</td>
<td>August 30</td>
<td>Monday</td>
</tr>
</tbody>
</table>

*Some university departments may be open for limited service on these days.
<table>
<thead>
<tr>
<th>Month</th>
<th>January</th>
<th>April</th>
<th>July</th>
<th>October</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Month</th>
<th>January</th>
<th>April</th>
<th>July</th>
<th>October</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Month</th>
<th>January</th>
<th>April</th>
<th>July</th>
<th>October</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Month</th>
<th>January</th>
<th>April</th>
<th>July</th>
<th>October</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Month</th>
<th>January</th>
<th>April</th>
<th>July</th>
<th>October</th>
</tr>
</thead>
</table>
University of Waterloo Campus

Legend

- Information Kiosks
  After hours please enquire at Security Office (Com)

Parking
Visitor parking available in following lots:
B1, D - 50 cents per hour
(50 cent coin entry after 8 p.m.)
M, N, O - 50 cents per entry
(coin operated, two quarters)
H, B - evenings and week-ends only,
25 cent coin entry
C - student lot, 25 cent coin entry.
Reserved parking in other lots.

Visitors Reception Centre (VRC)
is located in the Administrative Services
Building (Adm)

Arts
Lib Dana Porter Library
AL Arts Lecture Hall
ML Modern Languages
  Theatre of the Arts;
  Art Gallery
HH J. G. Hagey Hall of Humanities
  Humanities Theatre
PAS Psychology, Anthropology, Sociology

Engineering
E1 Engineering 1
E2 Engineering 2
E3 Engineering 3
CPH Carl A. Pollock Hall
EL Engineering Lecture Hall

Environmental Studies
Env Environmental Studies
ES2 Environmental Studies 2
Arc Architecture

Human Kinetics and Leisure Studies
MC Office in Mathematics and Computer Building
PAc Physical Activities

Integrated Studies Programme
PAS Offices in PAS Building

Mathematics
MC Mathematics and Computer
EMS Library (Engineering, Mathematics and Science)

Science
Phy Physics
ESC Earth Sciences and Chemistry
C2 Chemistry 2
B1 Biology 1
Biology and Earth Sciences Museum
B2 Biology 2
Opt Optometry

Colleges
CGr Conrad Grebel College
Ren Renison College
StJ St. Jerome's College
NoD Notre Dame Women's Residence
StP St. Paul's College

Residences
V1 Student Village 1
V2 Student Village 2
TH Tutor Houses
MHR Minota Hagey Graduate Residence
MSA Married Students' Apartments

University Services
Adm Administrative Services
NH Needles Hall (Student Services)
SCH South Campus Hall
  Cafeteria; Book Store
CC Campus Centre
FC Faculty Club
CSB Central Services Building
Com Commissary (Security)
MSt Maintenance and Stores
GH Graduate House
HS Health Services
GrM Grounds Maintenance
  Radio Waterloo
BrH Brubacher House
CIF Clemmer Farm (Day Care)

Off-Campus Buildings
ES2 Environmental Studies 2
Arc Architecture, 419 Phillip St.
An1 Annex 1, 415 Phillip St.
SS Seagram Stadium (City of Waterloo)
Ham Hammarskjold Co-op Residence
CoR Phillip St. Co-op Residence
ReaC Resurrection College
To reach UW campus from Hwy. 401, take Interchange 35 and follow Hwy. 8 to Kitchener. Enter Conestoga Pkwy. by following Hwy. 7 East signs. Then follow Pkwy. to University Ave. W. exit; drive in a westerly direction on University Avenue to University of Waterloo.
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 current and official list of academic courses and programmes, policies, and regulations regarding admissions, examinations, and fees, as well as general information about the University. It also serves as an official and historical record of the University.

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 contains general information about the University. The second division outlines the undergraduate programmes and the third division describes the courses offered in these programmes. The last division of the Calendar describes the general administrative structure of the University.

The information in this Calendar applies to the 1981-82 academic session which commences in September 1981.

The University

Classes at the University of Waterloo commenced in July, 1957, with the introduction of the Co-operative Engineering Programme. In March, 1959, a Private Bill was approved by the Legislative Assembly of the Province of Ontario incorporating the University of Waterloo as a degree-granting institution offering courses at both the undergraduate and the graduate level. The University is co-educational and non-denominational. Programmes are offered in Architecture, Arts, Engineering, Environmental Studies, Integrated Studies, Mathematics, Optometry, Human Kinetics and Leisure Studies, Science and Urban and Regional Planning. 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 190,000.

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

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 focussed 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 a 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 jurisdiction 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 Integrated Studies Programme.

Full time enrolment for each Faculty including church colleges and off campus students (as of November 1, 1980)

| Faculty of Arts | 2,612 |
| Faculty of Engineering | 3,298 |
| Faculty of Environmental Studies | 1,283 |
| Faculty of Human Kinetics and Leisure Studies | 1,089 |
| Integrated Studies Programme | 80 |
| Faculty of Mathematics | 3,463 |
| Faculty of Science | 1,921 |

Total Undergraduate Enrolment (Full-Time) 13,736
Graduate Student Enrolment (Full-Time) 1,100

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 which had been affiliated with the University of Ottawa before entering into federation with the University of Waterloo in July, 1960. It offers a complete range of undergraduate courses in the Faculty of Arts and registers students in regular Mathematics programmes. Students registered at St. Jerome’s College freely supplement their programmes with courses offered at the University and students registered at the University complement their programmes with courses offered uniquely at St. Jerome’s. In this Calendar, St. Jerome’s faculty members and courses are indicated by a J suffix. Graduates of the college receive University of Waterloo degrees in accordance with the terms of the federation agreement. A continuous building programme since 1962 finds St. Jerome’s presently with a teaching and administration building, a library, a men’s residence accommodating 110 and a women’s residence, Notre Dame College, operated by the School Sisters of Notre Dame, which has room for 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 which could emphasize the virtues of intimacy, creativity, and innovation with regard to both teaching and residential life.

Academic offerings at Renison include courses in two areas:
a) Social Development Studies Programme, and
b) General Arts.

The former is an integrated programme of courses in the areas of Social Work, Psychology, Sociology and Interdisciplinary Social Science, with emphasis on both classroom study and community involvement. Within General Arts are courses in Arts, English, Fine Arts, Geography, History, Psychology, Religious Studies and Sociology. Renison College faculty members and courses are indicated by an R suffix.

The college has two residences accommodating 100 men and 75 women.

Conrad Grebel College

Conrad Grebel College is a Mennonite school with residential, teaching, research, and community programmes. Its courses are open to all students on campus. In the Calendar, Conrad Grebel College courses have a G suffix, and they can be found under Arts, History, Music (Fine Arts), Religion and Sociology. Special emphases include Peace Studies in the various disciplines. The academic programme in music at the University is administered by Conrad Grebel College. There are several choirs, choral, and instrumental ensembles.

The College provides residence accommodation for 115 students.

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 programmes 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 enable students to understand the relationship between religious growth and experience, and the dynamics of personality development.

Students should consult the appropriate section of the University calendar for more information about these two options.
The College also offers a limited number of courses in Religious Studies, which 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, but there is no requirement that a student be registered in one of the above programmes in order to live in this residence. Resident life in the College provides a valuable contribution to university experience beyond that which comes from courses taken for credit. Through a programme of athletics, community dinners, and interest groups engaged in various projects and issues relating to the University, the Church, personal life and society, members of the College and Associates participate in a vital and enriching community.

Degrees Offered

The University of Waterloo offers the following undergraduate degrees:

<table>
<thead>
<tr>
<th>Degree Type</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bachelor of Architecture</td>
<td>BArch</td>
</tr>
<tr>
<td>Bachelor of Arts</td>
<td>BA</td>
</tr>
<tr>
<td>Bachelor of Applied Science</td>
<td>BASc</td>
</tr>
<tr>
<td>Bachelor of Environmental Studies</td>
<td>BES</td>
</tr>
<tr>
<td>Bachelor of Independent Studies</td>
<td>BIS</td>
</tr>
<tr>
<td>Bachelor of Mathematics</td>
<td>BMath</td>
</tr>
<tr>
<td>Bachelor of Science</td>
<td>BSc</td>
</tr>
<tr>
<td>Doctor of Optometry</td>
<td>OD</td>
</tr>
</tbody>
</table>

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

The University of Waterloo offers the following graduate degrees:

<table>
<thead>
<tr>
<th>Degree Type</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Master of Arts</td>
<td>MA</td>
</tr>
<tr>
<td>Master of Applied Science</td>
<td>MASc</td>
</tr>
<tr>
<td>Master of Mathematics</td>
<td>MMath</td>
</tr>
<tr>
<td>Master of Philosophy</td>
<td>MPhil</td>
</tr>
<tr>
<td>Master of Science</td>
<td>MSc</td>
</tr>
<tr>
<td>Doctor of Philosophy</td>
<td>PhD</td>
</tr>
</tbody>
</table>

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

Honorary Degrees

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

<table>
<thead>
<tr>
<th>Degree Type</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doctor of Engineering</td>
<td>DEng</td>
</tr>
<tr>
<td>Doctor of Environmental Studies</td>
<td>DES</td>
</tr>
<tr>
<td>Doctor of Laws</td>
<td>LLD</td>
</tr>
<tr>
<td>Doctor of Letters</td>
<td>DLitt</td>
</tr>
<tr>
<td>Doctor of Mathematics</td>
<td>DMath</td>
</tr>
<tr>
<td>Doctor of Science</td>
<td>DSc</td>
</tr>
</tbody>
</table>

Systems of Study

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

Regular System

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

Co-operative System

Students studying under the Co-operative System alternate academic 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

The University makes a special effort to provide opportunities for students pursuing a degree on a part-time basis. These students may:

- normally take any of UW's regularly scheduled daytime classes in the Fall, Winter and Spring terms;
- choose from a large number of late afternoon and evening courses scheduled for their convenience in each term;
- choose from over 250 courses offered through the Correspondence Programme;
- take courses offered primarily through the Faculty of Arts in a six-week Summer Session;
- take courses offered each term at various off-campus centres.

Some degrees may be completed entirely by part-time study.
There is no distinction between part-time and full-time students with regard to admission requirements, grading practices and promotion policies. Tuition is assessed on a fee-per-course basis for both part-time and full-time students.

Individuals of mature age who do not possess the normal minimum admission requirements may apply under the adult student clause. Information regarding the availability of courses and admission and registration procedures can be obtained from the Part-Time Studies Office, Needles Hall.

Part-time Studies Off-Campus
Over forty University of Waterloo credit courses are now being offered annually off-campus in the local area and in such communities as Orangeville, Halton Hills, Walkerton, Cambridge, Stratford and Simcoe. Most of these courses meet in the evening for three hours each week during one term (Fall, Winter or Spring), although some are held in the day-time hours and through two terms. These courses may also be attended as free public interest lectures. For information about 1981-82 off-campus lectures, call or write the Part-Time Studies Office. (519-885-1211, ext. 3447)

Correspondence Courses
The University of Waterloo offers more than 275 degree-credit courses by correspondence in almost 50 subject areas.

Specially prepared lectures, recorded on audio tape cassettes, and accompanying lecture notes are prepared by the professors to explain and supplement material in the text. These, together with assignments, form the basis of the courses.

The courses may be taken by anyone with a suitable academic background and can be used for credit towards a degree at the University of Waterloo. General Degree programmes in Arts, Mathematics and Science may be taken entirely on a part-time basis by correspondence or by any combination of correspondence, regular or summer courses which will fulfill the degree requirements of the faculty.

Further information and correspondence application forms are included in the Correspondence Calendar which can be obtained from:

Correspondence Programme
University of Waterloo
Waterloo, Ontario
N2L 3G1
(519) 885-1211, ext. 3901

Co-operative Arrangements with the University of Western Ontario for B.Sc.N. Programme for Registered Nurses
Arrangements have been made for registered nurses in the Kitchener-Waterloo area to take specified courses at the University of Waterloo and apply these to a Bachelor of Science - Nursing degree at the University of Western Ontario. These courses are available on a part-time basis in the daytime or evening, or by correspondence. Further information is available from the Faculty of Nursing, University of Western Ontario or from the UW Part-time Studies Office.

Diploma in Occupational Health for Registered Nurses
The University has assembled a series of ten half-credit degree courses plus two special nursing process courses to provide instruction in a broad range of subjects pertinent to the needs and interests of practitioners in the occupational health field. These courses are offered on campus in the daytime or evening and through the Correspondence Programme.

Further information is available from the Part-time Studies Office.

Continuing Education
Through a number of channels the University recognizes its responsibility for the continuing education of adults.

A number of academic departments sponsor special lecture series of interest to all persons in the community. Information regarding these series can be obtained from the department concerned or from the Part-Time Studies Office.

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 in February or March for their own students who plan to return in the next academic year. Course limits are adjusted on the basis of the demand indicated and tentative space is provided for Cross-registered students in the courses concerned. Formal requests to Cross-register are accepted only after the academic timetables are finalized in August.

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., will be applicable where the student is
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 sections for a complete breakdown of the appropriate grading system.

<table>
<thead>
<tr>
<th>Assigned Letter</th>
<th>Common</th>
<th>Assigned Factors</th>
<th>Assigned Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>A+</td>
<td>95</td>
<td>95</td>
<td>90-100</td>
</tr>
<tr>
<td>A</td>
<td>89</td>
<td>89</td>
<td>85-89</td>
</tr>
<tr>
<td>A-</td>
<td>83</td>
<td>83</td>
<td>80-84</td>
</tr>
<tr>
<td>B+</td>
<td>78</td>
<td>78</td>
<td>77-79</td>
</tr>
<tr>
<td>B</td>
<td>75</td>
<td>75</td>
<td>73-76</td>
</tr>
<tr>
<td>B-</td>
<td>72</td>
<td>72</td>
<td>70-72</td>
</tr>
<tr>
<td>C+</td>
<td>68</td>
<td>68</td>
<td>67-69</td>
</tr>
<tr>
<td>C</td>
<td>65</td>
<td>65</td>
<td>63-66</td>
</tr>
<tr>
<td>C-</td>
<td>62</td>
<td>62</td>
<td>60-62</td>
</tr>
<tr>
<td>D+</td>
<td>58</td>
<td>58</td>
<td>57-59</td>
</tr>
<tr>
<td>D</td>
<td>55</td>
<td>55</td>
<td>53-56</td>
</tr>
<tr>
<td>D-</td>
<td>52</td>
<td>52</td>
<td>50-52</td>
</tr>
<tr>
<td>F+</td>
<td>46</td>
<td>46</td>
<td>42-49</td>
</tr>
<tr>
<td>F</td>
<td>38</td>
<td>38</td>
<td>35-41</td>
</tr>
<tr>
<td>F-</td>
<td>32</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.

Interpretation of Averages

Averages are classified in the following broad categories. The “Passing” and “Failure” categories do not apply to the Faculty of Engineering (refer to the Engineering Examinations and Promotions policy, Chapter 9).

<table>
<thead>
<tr>
<th>Honours</th>
<th>General</th>
</tr>
</thead>
<tbody>
<tr>
<td>80-100</td>
<td>Excellent</td>
</tr>
<tr>
<td>70-79.99</td>
<td>Very Good</td>
</tr>
<tr>
<td>60-69.99</td>
<td>Good</td>
</tr>
<tr>
<td>50-59.99</td>
<td>Passing</td>
</tr>
<tr>
<td>0-49</td>
<td>Failure</td>
</tr>
</tbody>
</table>

Non-Graded Standings

| CR | Credit Granted |
| AEG | Aegrotat, credit granted due to illness |
| NCR | No credit granted |
| INC | Incomplete course work, no credit granted |
| DNW | Did not write examination, no credit granted |
| AUD | Audit only, no credit granted |
| NMR | No mark reported |

Examination Regulations

The following are excerpts from the Senate Regulations governing Examination Procedures; 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 programme sections of this Calendar, Chapter 7-14.

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.

Each term the formal lecture period, as defined by the dates shown on pages 5-8 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.

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

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

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

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.

Academic Offenses

Disciplinary jurisdiction with respect to all students is vested in the Board of Governors which may delegate its authority in any particular case to the President. The President normally delegates to the Faculty Deans his authority to deal with academic offenses, except that he may not delegate his authority to expel a student from the University.

The following is a condensed version of the Report of the Senate Committee on Academic Regulations and Discipline (approved by Senate December 18, 1970).

Any act by a student which is in violation of any academic regulation of the University shall be considered an academic offense. The following list of examples of academic offenses is not necessarily all-inclusive: cheating on examinations or tests; being impersonated by or impersonation of another student; plagiarism; theft of examination papers, their distribution or use; falsification of academic records.

When an academic offense has allegedly occurred, the individual is presumed innocent until the contrary is established. In all cases reasonable effort should be made to settle any disciplinary issue, including alleged academic offenses, by means of informal discussions between the student(s) involved and the faculty member(s) concerned.

For academic offenses that cannot be resolved by discussion, formal procedures involving an Advisory Committee on Academic Discipline established to advise the Dean of the faculty may be invoked. The membership of the Committee is as follows: a non-voting chairman, who shall be the Associate Dean, one faculty member from each department within the faculty, and two students appointed by the student society of the faculty. Full details of the procedures are contained in the Report.

For a student found guilty of an academic offense one of three disciplinary actions may be recommended to the Dean:

1) Probation, for a stated period of time;
2) Suspension, for a stated period of time;
3) Expulsion, which shall be permanent.

If the recommendation is for expulsion, the final decision shall rest with the President.

Right of Appeal
A student may appeal any decision by the Dean to the President.

The complete version of the Report on Academic Regulations and Discipline may be obtained from the University Secretariat or from the office of the Dean in each faculty.
Student and Administrative Services

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

Federation of Students

Campus Centre

Opportunity to participate in extracurricular activities is provided by the Federation of Students. All undergraduate students at Waterloo are members of the Federation of Students. The Charter of the Federation of Students, which guarantees certain rights and privileges to students, was approved by the Board of Governors of the University and then by the Provincial Secretary on April 27, 1967.

Objects

The principal “Objects” of the Federation are:

To promote the welfare and common interests of the students of the University of Waterloo.

To act as the representative of the students.

To promote and maintain responsible student government.

To promote and co-ordinate student participation in athletics, cultural and social activities.

To promote and maintain communications between the student body and the duly elected and appointed authorities of the University of Waterloo.

The Students’ Council

Twenty-nine elected members plus officers make up the Students’ Council. Members representing all faculties, societies and colleges are included.

The functions of the Students’ Council, the governing body of the Federation, include upholding the objects of the Federation, administration and control of finance, and operation and control of all Boards and Committees of the Council. Social and cultural activities of the student body are managed by the Students’ Council as well as off-campus representation of the student body.

The Executive Board

The Executive Board is composed of the principal officers including the President, Vice-President, Treasurer, and all Board Chairmen. The Board controls day-to-day administration, finance, and recommends policy to the Students’ Council. It also co-ordinates programmes of all other Boards and provides liaison between them.

The Creative Arts Board

The Creative Arts Board provides activities in music, drama and dance.

The Board of External Relations

The Board of External Relations handles activities which connect and relate the student to the local, national and international communities.

The Board of Education

The Board of Education sponsors programmes to examine and improve the quality of education.

The Board of Entertainment

The Board of Entertainment co-ordinates and supervises campus-wide special programmes, including, Freshman Orientation, “pubs”, and concerts.

The Board of Co-operative Services

The Toronto bus service, the campus centre ice cream stand, a used book store and large concerts are operated by the Board.

The overriding policy of the Board is to operate on as close to a break-even point as possible.

The Board of Communications

The Board is responsible for overseeing the various publications of the Federation. These include the student handbook, published annually; the student directories which may be published each term and various other less regular publications. More details on each of the Boards and their activities are outlined in the Student Handbook.

Persons wishing more information on any aspect of Federation activities are advised to write to the Federation of Students.

The Student Newspaper

UW’s student newspaper, Imprint, is published every Friday by Imprint Publications, Waterloo, a non-profit corporation independent of the Federation. Student involvement is welcome.

Athletics

Physical Activities Building

The Department of Athletics offers a complete programme of intercollegiate and intramural activities for the enjoyment of the university community.

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.
Career Information Centre
Needles Hall
The Centre contains material which assists students in self-assessment and provides information about possible employers and various careers. There are calendars and educational directories for Canada and abroad. The Centre also provides materials which assist in résumé and letter preparation, creative approaches to job searching and preparation for interviews.

Centre for the Arts
Room 161, Hagey Hall of the Humanities
The Centre administers the two theatres and the Art Gallery. It sponsors a series of professional attractions and, in conjunction with the Federation of Students, it provides participating activities in music, drama and dance.

The Department of Computing Services
Mathematics and Computer Building
The Department of Computing Services, located on the first two floors of the Mathematics and Computer Centre building, provides computing facilities and services for faculty, staff, graduate and undergraduate students. The facilities include key-punches, terminals and programme preparation areas, an input/output area for submission of batch jobs and retrieval of printed output, an incremental plotting facility, and a variety of computing 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 the computer in course assignments. Administrative staff also use the computer in applications such as student records, course timetables, examination results, and financial accounting.

Most students, particularly at first and second year levels, gain access to the computer through a system called WIDJET (Waterloo Interactive Debug Job Entry Terminals). WIDJET connects the student, sitting at a key-driven CRT terminal, to a mini-computer which allows the student to construct a programme in a text-editing environment. When the programme is developed, it can be sent for compilation and execution over a high speed communication facility to a large IBM computer. Results are returned to the student's terminal, and if the run was successful the student can have the output directed to an on-line printer. The WIDJET system has largely replaced a cafeteria style batch job entry system which also gives students access to student-oriented software, pioneered by the University of Waterloo, on large IBM computers.

Some advanced users also use both the WIDJET and cafeteria style DEBUG service for preliminary work. However most advanced users do both development and production work using VM/370 CMS. The VM/CMS operating system provides both a time-sharing environment and a general BATCH environment, and includes text-editing software, special applications packages and specialized environments such as APL. In this environment users can develop and execute programmes, with a choice of several languages, in an interactive manner. Human productivity can be increased, then, particularly during programme development. Repetitive production programmes can be run more economically using the CMS BATCH facility. The virtual memory capabilities of VM/370 make it possible to service users with applications requiring large blocks of memory.

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.

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 8:30 a.m. to 5:00 p.m., Monday through Friday.

Dean of Women
Room 225, Modern Languages Building
This office serves as a general academic information and advisory centre for all students and arranges programmes especially for mature women students.
Health Services
Health Services Building
Health Services is the Medical clinic centrally located on campus. It provides comprehensive health care to all students and emergency care to anyone on campus. Physicians, nurses and a counsellor are on staff at the clinic which is open Monday to Friday from 8:30 a.m. to 6:00 p.m. (8:30 a.m.-5:00 p.m. May-August). Also provided is a 24-hour physician-on-call service. Physicians' services are covered as well by a Student Supplementary Health Insurance Plan. For further information on Health Services or the Insurance Plan, obtain a copy of “The People Place” at Health Services or call the clinic at (519) 885-1211, ext. 3541.

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 Administration
(Incorporating Waterloo Research Institute)
The Office of Research Administration (ORA), now located on the third floor of Ira Needles Hall, is responsible for faculty grant applications and contract research, as well as the distribution of grant information and regulations.

Among the functions of the ORA are the following: to ensure that university policies and agency/sponsor requirements are met; to provide faculty with information and application forms; to forward applications and proposals to appropriate agencies; to act as a centre of communications between granting agencies and faculty; and to assist faculty in obtaining grants and contracts for undertaking research.

The ORA also administers the University's patent assistance programme.

Contract Research: In this regard the ORA 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 ORA 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.

Research Involving Human Subjects: The Coordinator (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 Coordinator is also responsible for obtaining school age children as subjects for suitable university research projects.

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.

The Ontario Industrial Innovation Centre: The Ontario Industrial Innovation Centre is established to promote an interest in technological entrepreneurship and to assist inventors in moving scientific and technical developments toward the marketplace.

Waterloo Enterprise Programme: The Waterloo Enterprise Programme for student inventors and entrepreneurs helps students to develop their own good inventions and ideas for new business ventures towards a profitable result. Guidance in technical and business matters, and some financial assistance are available.

The programme is made possible by the University of Waterloo through the Ontario Industrial Innovation Centre which exists to stimulate and improve innovation in Canada. The Waterloo Enterprise Fund was established for the sole purpose of providing financial support to the Waterloo Enterprise Programme.

Students may obtain further information and application forms from the Ontario Industrial Innovation Centre Office, telephone extension 3003.
Residences
Accommodation is available at the University for approximately 4,000 students. There are two large undergraduate residences, Village 1 and Village 2; 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 2, 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 1,
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 3G6
or phone (519) 885-0220
Renison College,
Westmount Rd. N.,
Waterloo, Ontario
N2L 3G4
or phone (519) 884-4400
St. Paul’s United College,
Waterloo, Ontario
N2L 3G5
or phone (519) 885-1460
Married Students’ Apartments,
150 University Ave. W.,
Room 0104,
Waterloo, Ontario.
N2L 3E8
or phone (519) 884-0310

Facilities for the Physically Handicapped
The University has developed a number of services to assist students with physical disabilities.
All buildings on campus have at least one ramped entrance for convenient access. (Engineering Lecture Hall can be entered by means of the service elevator in Engineering 2.) Ramped areas on campus are constantly being improved and new ones are under construction. Most buildings have suitable washroom facilities or are connected with a building that does.

The University operates an Office for the Physically Handicapped. Students who require information on services or accessibility should contact this office (Village I) at ext. 2678. Fifty-two rooms in the Village 1 and Village 2 residences are equipped for students with serious physical disabilities. These students are given priority for acceptance into the residences. Students should indicate their physical disabilities on their residence application forms. They will be contacted by the Director of Housing before the offer of residence is accepted. Students will be invited to stay in residence for a trial period of a day or two to experience, list, and evaluate the living conditions. All students on campus who have physical disabilities are encouraged to register with the Office for the Physically Handicapped.

International Student Office
The International Student Office (ISO), located on the second floor of Needles Hall (within Counselling Services) provides information and assistance to foreign students in the areas of immigration laws, university and community services, personal and financial problems and language difficulty.

Teaching Resource Office
Teaching Resource Office 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, and keeping the university community informed about developments and innovations relevant to teaching and learning in higher education. The office, which includes a small library of resource materials, is located in Needles Hall, Room 3005, ext. 2579.
Visitors Reception Centre
The centre, located in the Administrative Services Building, 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. each day and are about 1½ hours long. Students can also arrange to visit specific departments and meet with faculty members about programmes 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

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

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

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

More detailed information regarding admission requirements is available from the Assistant Registrar (indicate Faculty desired).

Applicants are advised to outline thoroughly their educational background in order to facilitate the admission process. The admission information and requirements set forth in the Calendar are applicable for admission beginning in September 1981.

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 other than the appropriate Admissions Committee.

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

The University reserves the right to withdraw the offer of admission made to an Ontario secondary school student if the applicant fails to complete Grade 13 satisfactorily.

St. Jerome's College

Applicants may apply for Programmes in Arts and Mathematics (regular programme only) through St. Jerome's College. All applicants should indicate clearly "St. Jerome's College" on their application form. All transcripts and documents should be sent directly to the College.

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

Renison College

Applicants may apply for the Social Development Studies Programme and for General Arts Programmes 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 Grade 13 curriculum.

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

Applicants educated outside of Ontario must submit evidence of having obtained a level of education equivalent to Ontario Grade 13 (see chart on page 28) as well as meeting average requirements.

A programme is designated "limited enrolment" because the number of qualified applicants usually exceeds the number of places available. In 1981, all Co-operative Programmes will have limited enrolment, as well as the Regular Programmes in Health Studies, Kinesiology, Mathematics, Optometry, Recreation, and Urban and Regional Planning.

Normally students who are refused admission to a particular programme will automatically be considered for admission to other programmes for which they satisfy the specific subject and marks requirements.
Applicants - Ontario Grade 13

For all programmes, the University normally requires completion of an Ontario grade 13 programme, comprising at least 6 grade 13 credits, leading towards the Secondary School Honour Graduation Diploma. A minimum average of 60% is normally required for admission. The following criteria are used in selecting applicants for admission: Grade 13 interim or final standing; Grade 12 final standing; Principal’s recommendation.

The 1981-82 Admission Requirements for applicants from Ontario Grade 13 Programmes are shown in the accompanying chart on page 26.

Applicants - Other than Ontario Grade 13

Applicants who are not currently registered in Ontario Grade 13 are considered under the following broad categories. These categories serve to identify general areas of academic preparation.

Adult Students

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 adult students.

Applicants applying as adult 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 adult students attempt to obtain standing in at least one Ontario Grade 13 level subject or its equivalent. This preparation should relate to the programme the applicant wishes to study at the University. Applicants to programmes requiring specific Ontario Grade 13 level 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.

Adult students who are not interested in pursuing a degree may apply on a non-degree basis. Courses taken under this provision will count toward a degree if the student is admitted later as a degree candidate.

Advanced Standing

Applicants to advanced years must specify the Faculty to which they are seeking admission, the programme they wish to study, and the level of admission sought. All programmes, with the exception of Architecture, Engineering, Integrated 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. 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 programme applied to, the relevancy of the previous programme studied, and approval from the appropriate department that such courses are to be credited to the student’s programme.

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 programme at an Ontario College of Applied Arts and Technology are considered for admission to Year Two of a relevant programme at the University of Waterloo.

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.

Text continued on page 31
## Specific Faculty Programme Recommendations and Requirements

<table>
<thead>
<tr>
<th>Faculty</th>
<th>Required Grade 13 Subjects and Averages</th>
<th>Recommendations</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Arts</strong></td>
<td>A 60% overall average is required in 6 Grade 13 credits</td>
<td>Applicants should include Grade 13 courses such as English, History, Languages (other than English) in their Grade 13 programme. Grade 13 English courses, particularly those that stress writing skills, are especially recommended. A Grade 13 Mathematics course is recommended for applicants who are considering Social Science programmes.</td>
<td>Admission to departmental programmes occurs following year one. Students also may apply for co-op programmes in Arts Faculty disciplines during year 1 or year 2.</td>
</tr>
<tr>
<td><strong>Co-op</strong></td>
<td>A 70% overall average is required in 6 Grade 13 credits</td>
<td>Applicants should include Grade 13 courses such as English, History, Science, Mathematics and a second language in their Grade 13 programme.</td>
<td>Enrolment in this programme is limited. Applicants not admitted to Arts Co-op will be considered for the Arts Regular programme. Admission to Arts Co-op is also available at the Year 2 level.</td>
</tr>
<tr>
<td><strong>Engineering</strong></td>
<td>Relations &amp; Functions, Calculus, Physics, Chemistry, one unspecified credit</td>
<td>Applicants with high overall standing who are missing one or two of the five specific Grade 13 requirements must contact the Admissions Officer no later than January (for September admission). Applicants will be evaluated and advised on possible 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 and writing performance such as English, History, Geography, etc.</td>
<td>Year 1 enrolment is limited to 730 students. Approximately 90% of these places are filled by Ontario Grade 13 students. In recent years, most students admitted have Grade 13 averages in the required subjects of 75% or better. However a number of students with lower averages are admitted when other evidence indicates an aptitude and interest in Engineering. The University reserves the right to withdraw offers of early admission for students receiving final marks below 60% in any of the 6 credits.</td>
</tr>
<tr>
<td><strong>Environmental Studies</strong></td>
<td></td>
<td>Because of the increasing use of statistics and quantitative methods in environmental research, students should be encouraged to consider at least one Grade 13 Mathematics course for admission to any programme in Environmental Studies.</td>
<td></td>
</tr>
<tr>
<td><strong>Architecture (pre-professional programme)</strong></td>
<td>In addition to the 60% minimum overall average on 6 Grade 13 credits, a 60% overall average is required in Relations &amp; Functions, Calculus, Physics, English (Français).</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 Grade 13 standings. Admission is based on the results of the interview, including a required portfolio, an English writing exercise designed to test skills of analysis and expression, and on secondary school achievement. The first year programme is limited to 70 students.</td>
<td></td>
</tr>
<tr>
<td>Faculty</td>
<td>Required Grade 13 Subjects and Averages</td>
<td>Recommendations</td>
<td>Comments</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>----------------------------------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Geography</td>
<td>A 60% overall average is required in 6 Grade 13 credits.</td>
<td>Applicants are encouraged to include Geography in their Grade 13 programme.</td>
<td>The first year programme is limited to approximately 70 students.</td>
</tr>
<tr>
<td>Man-Environment Studies</td>
<td>A 60% overall average is required in 6 Grade 13 credits.</td>
<td></td>
<td>The first year programme is limited to 70 students. 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 Grade 13 standings. Admission is based on the results of the interview and on secondary school achievement.</td>
</tr>
<tr>
<td>Urban and Regional Planning</td>
<td>A 60% overall average is required in 6 Grade 13 credits.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Human Kinetics</td>
<td>A 60% overall average is required in 6 Grade 13 credits.</td>
<td>Applicants to the Honours B.Sc. degree programme are encouraged to include Algebra, Biology, Functions &amp; Relations, Calculus and Physics in their Grade 13 programme.</td>
<td>Applicants to the Dance programme must take an interview. Auditions will be held for advanced placement in studio courses. Applicants unable to travel to Waterloo for the audition/interview should contact the Undergraduate Officer to make other arrangements.</td>
</tr>
<tr>
<td>&amp; Leisure Studies</td>
<td>A 60% overall average is required in 6 Grade 13 credits.</td>
<td>Applicants are encouraged to include Grade 13 Biology and Chemistry in their Grade 13 programme.</td>
<td>Applicants with overall Grade 13 averages above 65% are given first consideration. Students applying to the joint Honours programme in Health Studies - Kinesiology must fulfill the Kinesiology admission requirements.</td>
</tr>
<tr>
<td>Dance</td>
<td>A 60% overall average is required in 6 Grade 13 credits.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health Studies</td>
<td>A 60% overall average is required in 6 Grade 13 credits.</td>
<td>Applicants are encouraged to include Grade 13 Biology and Chemistry in their Grade 13 programme.</td>
<td></td>
</tr>
<tr>
<td>Kinesiology</td>
<td>In addition to the 60% minimum overall average on 6 Grade 13 credits, applicants must present a Grade 13 Mathematics course and two Grade 13 courses from Biology, Chemistry, Physics.</td>
<td>Applicants are encouraged to include four Grade 13 courses from Biology, Chemistry, Physics, Functions &amp; Relations, Algebra and Calculus.</td>
<td>Applicants are reminded that the Kinesiology programme includes required University courses in Calculus, Biology, Chemistry, Physics and Computer Science.</td>
</tr>
<tr>
<td>Recreation</td>
<td>In addition to the 60% minimum overall average on 6 Grade 13 credits, applicants must present one Grade 13 mathematics course.</td>
<td></td>
<td>Applicants with overall Grade 13 averages above 65% are given first consideration. Applicants may be required to come to the University for an interview as part of the admission process. Admission is based on the results of the interview, if required, a “statement of interest” form, and secondary school achievement.</td>
</tr>
<tr>
<td>Integrated Studies</td>
<td>In addition to the 60% minimum overall average on 6 Grade 13 credits, applicants must present three Grade 13 mathematics courses.</td>
<td></td>
<td>Each applicant to Integrated Studies is considered on the basis of a personal interview with a committee composed of students, resource persons 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>
</tr>
<tr>
<td>Mathematics</td>
<td>In addition to the 60% minimum overall average on 6 Grade 13 credits, applicants to the Regular Mathematics programme must present a 60% overall average in Calculus, Algebra, and Relations &amp; Functions. Applicants to the Co-operative Mathematics programmes must present 66% on these three Mathematics courses.</td>
<td>Students with high overall standing who are missing one of the three specific requirements are encouraged to apply. Those students should contact the Assistant Registrar, Mathematics, as soon as possible for advice on how to fill any gaps in their mathematical background.</td>
<td>Competition for admission to Mathematics programmes has been keen over the past several years particularly in the Co-operative programmes. Accordingly, applicants not offered admission to Co-op will automatically be considered for admission to Regular.</td>
</tr>
</tbody>
</table>
### Admissions
Specific Faculty Programme Recommendations and Requirements

<table>
<thead>
<tr>
<th>Faculty</th>
<th>Required Grade 13 Subjects and Averages</th>
<th>Recommendations</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Science</strong></td>
<td></td>
<td>Applicants to all Science programmes are advised to select both Grade 13 Chemistry and Physics courses.</td>
<td>Applicants with overall Grade 13 averages of 65% or higher will be given first consideration. Those with less than 65% may be invited to come to the University for an interview to discuss their qualifications and career objectives.</td>
</tr>
<tr>
<td><strong>Regular</strong></td>
<td>Science Applicants to all Science Applicants with overall Grade 13</td>
<td>In addition to the 60% minimum overall average on 6 Grade 13 credits, applicants must present a 60% overall average on two Science courses (one of which must be Chemistry or Physics), Calculus, and one Mathematics course from Relations &amp; Functions or Algebra.</td>
<td></td>
</tr>
<tr>
<td><strong>Optometry</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Co-operative Biology</strong></td>
<td></td>
<td>Same as above.</td>
<td>Applicants to the Co-operative Biology programme with an overall average of over 70% are given first consideration.</td>
</tr>
<tr>
<td><strong>Co-operative Applied Earth Sciences</strong></td>
<td></td>
<td>Same as above</td>
<td>Applicants to the Co-operative Applied Earth Sciences programme with an overall average of over 70% are given first consideration.</td>
</tr>
<tr>
<td><strong>Co-operative Applied Chemistry</strong></td>
<td></td>
<td>In addition to the 60% minimum overall average on 6 Grade 13 credits, applicants must present two Science courses (one of which must be Chemistry), Calculus, and one other Mathematics course from Relations &amp; Functions or Algebra. A 70% average is required in the Chemistry and Mathematics courses.</td>
<td>Applicants to Co-operative Chemistry and Physics are advised to select both Relations &amp; Functions and Algebra in addition to the required Calculus course.</td>
</tr>
<tr>
<td><strong>Co-operative Applied Physics</strong></td>
<td></td>
<td>In addition to the 60% minimum overall average on 6 Grade 13 credits, applicants must present two Science courses (one of which must be Physics), Calculus, and one other Mathematics course from Relations &amp; Functions or Algebra. A 70% overall average is required in Physics and Mathematics courses.</td>
<td>Applicants to Co-operative Chemistry and Physics are advised to select both Relations and Functions and Algebra in addition to the required Calculus course.</td>
</tr>
</tbody>
</table>
**Certificates Equivalent to the Ontario Secondary School Honour Graduation Diploma**

All applicants are required to hold the specific subject requirements indicated on pages 28-30 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.

**A) Applicants from Other Canadian Provinces**

- Alberta Grade 12
- British Columbia Grade 12
- Manitoba Grade 12
- New Brunswick Grade 12
- Newfoundland Year 1 Memorial University
- Nova Scotia Grade 12
- Prince Edward Island Year 1 University of P.E.I.
- Quebec First Year CEGEP programme or equivalent
- Saskatchewan Grade 12

**B) Applicants from Other Countries**

**Equivalent Certificates**

**Countries following a “British” System of Education**

General Certificate of Education or equivalent with passes in at least 5 subjects, 2 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 6 subjects, 3 higher level and 3 subsidiary level with a grade total not less than 26.

**Hong Kong**

Hong Kong Certificate of Education (English) and University of Hong Kong Matriculation (Advanced Level) with passes in at least 5 subjects, 2 of which must be at the Advanced Level. (Applicants with 3 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 programme.

**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**

- Baccalaureate Passable

**United States of America**

Secondary School Graduation plus an additional year of formal study in subjects comparable to Ontario Grade 13.

**Other Countries**

Normally the Secondary School programme 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.

**English Proficiency Test**

Applicants whose native language is not English are advised to take the "Test of English as a Foreign Language" (TOEFL). Normally, a score of 606 is required to satisfy the Admissions Committee that the applicant's knowledge of the English language is adequate to pursue university studies successfully.

In addition, applicants to Co-operative programmes must satisfy the Admissions Committee that they can perform satisfactorily in their work terms. The expenses involved in administering the test must be borne by the applicant.

**Permanent Resident Status**

Because of the nature of the co-operative programmes 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 programme. Exceptions can be made on an individual basis at the request of a government agency or other employer. Until such proof is received, applicants will be considered for a comparable programme, if available, offered under the regular system of study. If applying to Co-operative Engineering Programmes, Permanent Residents must have one year's work experience in Canada before applying for admission.
Application Procedures

1) Applicants who wish to study on a full time basis must submit their applications through the Ontario University 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 (e.g. mature applicants, applicants from outside Ontario) must complete OUAC form 105. These forms may be obtained from the Registrar's Office.

2) a) Applicants requesting part-time, or non degree courses should contact the Registrar's office for the appropriate application forms. Do not apply through the Application Centre.

   b) Applicants requesting correspondence courses should write to the Correspondence Programme, University of Waterloo, Ontario N2L 3G1 or call (519) 885-1211 extension 3901.

Note
When requesting an application form from the University, candidates should outline their academic background and indicate the exact programme 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, documents required etc. will be sent out with the application form.

3) Application Dates
Because of the number of applicants received each year, the University has established certain dates after which it cannot guarantee consideration of any application that is received.

   Session/Term starting          *Last date for application
   May 4, 1981                    March 1, 1981
   July 6, 1981                   June 1, 1981
   September 8, 1981             July 1, 1981
   January 4, 1982                November 1, 1981

   Correspondence Programme
   Fall Term 1981                 August 15, 1981
   Winter Term 1982               October 24, 1981
   Spring Term 1982               February 20, 1982

   *Applications and all supporting documentation must be received no later than May 1, 1981 for all Year 1 limited enrolment programmes, with the exception of Architecture, in which case applications must be received by April 1, 1981.

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

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

All Ontario Grade 13 applicants will be notified on or after June 12, 1981, of the status of their application for admission. Grade 13 applicants who do not receive an offer of admission at this time will have their applications deferred until the final Grade 13 marks are received by the University. When these marks have been received, qualified applicants will be admitted until the remaining places are filled.

Ontario Grade 13 applicants who receive an early offer of admission are encouraged to confirm as soon as possible, but are not required to respond before June 26, 1981.

Applicants who are not currently enrolled in an Ontario Grade 13 programme can expect to wait several weeks before receiving a decision on their application. Some programmes require applicants to come to the University for an admission interview and a decision cannot be made in such programmes until after the interview has been accomplished and the Admissions Committee has had ample opportunity to consider all of the information that has been presented to it. Applicants who feel there has been an undue delay in the consideration of their application should check to ensure that all required documents have been received by the appropriate Faculty area in the Registrar’s Office.

Release of Academic Information

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

Registration and Fees

Pre-registration is the process of choosing courses, having them approved by the appropriate advisor and recorded with the Registrar’s Office before classes begin.

Registration is completed when courses have been approved, fees paid, and a receipt issued.

Once admitted to the University, students are advised to pre-register for their courses well in advance of the beginning of lectures. First year students select their courses in conjunction with a member of the Dean’s office; advanced year students select their courses on the advice of the departmental undergraduate advisor. Students registering through Renison or St. Jerome’s select their courses with the appropriate advisor at the College. Information regarding pre-registration is forwarded when the student is admitted. Students are encouraged, where possible, to pre-register and pay their fees by mail. 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.

A schedule of fees is outlined in Chapter 3, page 39 of this calendar.
Fees and Registration
Pre-Registration, Registration, Fees

Pre-Registration
Pre-registration is the process of choosing courses, having them approved by the appropriate advisor and recorded with the Registrar’s Office before classes begin. All students must pre-register for courses as follows:

A) Returning Students:
1) Co-operative Programmes –
   During the preceding on-campus term.
2) Regular Programmes –
   During March of the preceding academic year.
B) Newly Admitted Students:
   As soon as possible after academic admission.

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

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.

Assessment
Fees are assessed as follows: (Foreign Students – see note 4 on page 40)

A) Co-operative Programmes
1) All Terms
   a) Engineering and Architecture
      Students are assessed on a programme 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 Programmes
      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 Programmes
1) Fall/Winter Session
   a) Architecture Year 1, Integrated Studies and Optometry
      Students are assessed on a programme basis for the Total Tuition and Incidental Fees shown on the Schedule of Fees.

   b) Other Regular Programmes
      Students are assessed by course at the Unit Course Fee shown to a maximum of the Basic Fee. Students taking more than two full courses are also assessed Incidental Fees.

2) Winter or Spring Term
   a) Architecture Year 1, Integrated Studies and Optometry
      Students are assessed on a programme basis for the Total Tuition and Incidental Fees shown on the Schedule of Fees.
   b) Other Regular Programmes
      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.

3) 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 5-8 for appropriate dates. Students must pay or arrange fees by these dates, whether or not a final class schedule has been received.

For sessional students unable to pay fees in full prior to the first day of lectures in September, the University will allow payment of fees in two instalments, the first payable before the start of lectures in September, and the second payable by the start of lectures in January. Instalment values are as follows:

1) For students assessed the Total Fee as shown in the Schedule of Fees, the first instalment will be for one-half of the tuition fee plus incidentals. The second instalment will be for the balance of the tuition fee.

2) For students assessed less than the Total Fee as shown in the Schedule of Fees, the first instalment will be for the value of the courses taken in the fall term plus incidentals. The second instalment will be for the balance of the tuition fee.
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 5 to 8 for appropriate dates.

3) General Information
i) Fees should be paid with cash, money order or certified cheque payable to “University of Waterloo”.

ii) Students registered through Renison College or St. Jerome’s College must pay their fees directly to the appropriate College.

iii) Fee payments by scholarships or bursaries not administered by the University or methods other than those outlined must be authorized in writing by Student Accounts, Financial Services.

iv) Students who have received a “Notice of Assessment” under the Ontario Student Assistance Programme may arrange payment of fees using this source of funds.

v) For the 1981/82 year, the University will accept post-dated cheques as an arrangement for the payment of fees. Students choosing this method of payment must post-date the cheque as follows:

<table>
<thead>
<tr>
<th>Session/Term</th>
<th>Cheque must be dated not later than</th>
</tr>
</thead>
<tbody>
<tr>
<td>September 1981</td>
<td>28 August 1981</td>
</tr>
<tr>
<td>January 1982</td>
<td>18 December 1981</td>
</tr>
<tr>
<td>May 1982</td>
<td>23 April 1982</td>
</tr>
</tbody>
</table>

vi) 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.

vii) 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 pre-registration.

viii) 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.

ix) Students who fail to fulfill fee payment arrangements will be assessed a 5% surcharge on the total fees outstanding plus 1% per month service charge applied to the balance outstanding and calculated from the due date.

x) 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.

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 two 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, see pages 5 to 8 for dates, will be assessed a late fee penalty as follows:

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

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

<table>
<thead>
<tr>
<th>Session/Term Starting</th>
<th>Last Date to Register</th>
</tr>
</thead>
<tbody>
<tr>
<td>May 1981</td>
<td>30 June 1981</td>
</tr>
<tr>
<td>July 1981</td>
<td>31 July 1981</td>
</tr>
<tr>
<td>September 1981</td>
<td>30 October 1981</td>
</tr>
<tr>
<td>January 1982</td>
<td>29 January 1982</td>
</tr>
<tr>
<td>May 1982</td>
<td>30 June 1982</td>
</tr>
</tbody>
</table>
Withdrawals
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 three weeks of a term (first week for Summer Session) will receive a full refund less a $25 registration charge. Part-time students will be charged $10.
c) Students withdrawing during weeks 4 to 7 of a term (second week of Summer Session) will receive a refund of 50% of one term fee plus the second term payment, if applicable.
d) Refunds are not provided to students after week 7 of a term (week 3 of Summer Session). Sessional students who withdraw after week 7 of the Fall term and before the start of the Winter Term will receive a refund of the second term tuition payment.
e) Requests for refunds of refundable incidental fees must be addressed to the organization concerned. Such refunds are available for only three weeks, after the start of classes.
f) The Intercollegiate Athletic fee is refundable on the same basis as tuition fees.
g) The Health Insurance Fee is refundable on a pro rata basis if the insurance card is handed in at the time of withdrawal.
h) Certain scholarships and bursaries are given on the condition of completion of the term or session 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 that necessary payment for added courses is made promptly. Failure to do so will result in penalty charges being assessed.

Schedule of Fees
The fee schedule is the one proposed for the 1981/82 year and at the time of printing is still subject to review and possible changes. If a fee change is made, a notice will be issued with a new schedule; however, the University does not undertake or accept responsibility to so notify all recipients of this calendar. The Board of Governors reserves the right to make changes in the published schedule of fees without notice.
### Schedule of Fees - Undergraduate Programmes - Tuition & Incidents for all Years

Foreign Students on Student Authorizations refer to page 40.

<table>
<thead>
<tr>
<th>Faculty</th>
<th>Session/Co-op</th>
<th>Term (Note 1)</th>
<th>Basic Fee $</th>
<th>Co-op Fee (Note 2)</th>
<th>Total Tuition Fees $</th>
<th>Total Incidental Fees $</th>
<th>Total Fees (Note 12) $</th>
<th>Unit Fee (Note 3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Architecture</td>
<td>Session</td>
<td>$942.00</td>
<td>—</td>
<td>$942.00</td>
<td>102.19</td>
<td>$1,044.19</td>
<td>97.00</td>
<td>$194.00</td>
</tr>
<tr>
<td></td>
<td>Term</td>
<td>$471.00</td>
<td>$93.25</td>
<td>$564.25</td>
<td>54.37</td>
<td>$618.62</td>
<td>97.00</td>
<td>$97.00</td>
</tr>
<tr>
<td>Arts</td>
<td>Session</td>
<td>$900.00</td>
<td>—</td>
<td>$900.00</td>
<td>97.19</td>
<td>$997.19</td>
<td>97.00</td>
<td>194.00</td>
</tr>
<tr>
<td></td>
<td>Term</td>
<td>$450.00</td>
<td>—</td>
<td>$450.00</td>
<td>44.23</td>
<td>$494.23</td>
<td>97.00</td>
<td>97.00</td>
</tr>
<tr>
<td></td>
<td>Term</td>
<td>$450.00</td>
<td>$93.25</td>
<td>$543.25</td>
<td>51.87</td>
<td>$595.12</td>
<td>97.00</td>
<td>97.00</td>
</tr>
<tr>
<td>Engineering</td>
<td>Term</td>
<td>$471.00</td>
<td>$93.25</td>
<td>$564.25</td>
<td>55.87</td>
<td>$620.12</td>
<td>97.00</td>
<td>97.00</td>
</tr>
<tr>
<td>Environmental Studies</td>
<td>Term</td>
<td>$900.00</td>
<td>—</td>
<td>$900.00</td>
<td>98.19</td>
<td>$998.19</td>
<td>97.00</td>
<td>194.00</td>
</tr>
<tr>
<td>HKLS</td>
<td>Session</td>
<td>$900.00</td>
<td>—</td>
<td>$900.00</td>
<td>98.19</td>
<td>$998.19</td>
<td>97.00</td>
<td>194.00</td>
</tr>
<tr>
<td></td>
<td>Term</td>
<td>$450.00</td>
<td>—</td>
<td>$450.00</td>
<td>44.73</td>
<td>$494.73</td>
<td>97.00</td>
<td>97.00</td>
</tr>
<tr>
<td></td>
<td>Term</td>
<td>$450.00</td>
<td>$93.25</td>
<td>$543.25</td>
<td>52.37</td>
<td>$595.62</td>
<td>97.00</td>
<td>97.00</td>
</tr>
<tr>
<td>Integrated Studies</td>
<td>Session</td>
<td>$900.00</td>
<td>—</td>
<td>$900.00</td>
<td>92.19</td>
<td>$992.19</td>
<td>97.00</td>
<td>194.00</td>
</tr>
<tr>
<td></td>
<td>Term</td>
<td>$450.00</td>
<td>—</td>
<td>$450.00</td>
<td>41.73</td>
<td>$491.73</td>
<td>97.00</td>
<td>97.00</td>
</tr>
<tr>
<td>Mathematics</td>
<td>Session</td>
<td>$900.00</td>
<td>—</td>
<td>$900.00</td>
<td>97.19</td>
<td>$997.19</td>
<td>97.00</td>
<td>194.00</td>
</tr>
<tr>
<td></td>
<td>Term</td>
<td>$450.00</td>
<td>—</td>
<td>$450.00</td>
<td>44.23</td>
<td>$494.23</td>
<td>97.00</td>
<td>97.00</td>
</tr>
<tr>
<td></td>
<td>Term</td>
<td>$450.00</td>
<td>$93.25</td>
<td>$543.25</td>
<td>51.87</td>
<td>$595.12</td>
<td>97.00</td>
<td>97.00</td>
</tr>
<tr>
<td>Optometry</td>
<td>Session</td>
<td>$942.00</td>
<td>—</td>
<td>$942.00</td>
<td>96.19</td>
<td>$1,038.19</td>
<td>97.00</td>
<td>194.00</td>
</tr>
<tr>
<td>Science</td>
<td>Session</td>
<td>$900.00</td>
<td>—</td>
<td>$900.00</td>
<td>96.19</td>
<td>$996.19</td>
<td>97.00</td>
<td>194.00</td>
</tr>
<tr>
<td></td>
<td>Term</td>
<td>$450.00</td>
<td>—</td>
<td>$450.00</td>
<td>43.73</td>
<td>$493.73</td>
<td>97.00</td>
<td>97.00</td>
</tr>
<tr>
<td></td>
<td>Term</td>
<td>$450.00</td>
<td>$93.25</td>
<td>$543.25</td>
<td>51.37</td>
<td>$594.62</td>
<td>97.00</td>
<td>97.00</td>
</tr>
<tr>
<td>Summer Session</td>
<td>Half Course</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>97.000</td>
</tr>
<tr>
<td></td>
<td>Full Course</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>194.000</td>
</tr>
</tbody>
</table>

Schedule of fees effective May 4, 1981, as known at the date of printing.
Fees and Registration
Schedule of Fees

Fees for Foreign Students with Student Authorizations
(see also Note 4)
Regular Programme fees are $1,790.00 per session or $895.00 per term plus incidental fees as shown above. The Unit Course Fee is $358.00 per Full Course or $179.00 per term course. Registration in Co-operative programmes is available only to students who are Canadian Citizens or Permanent Residents.

Incidental Fees
The following incidental fees are compulsory:

<table>
<thead>
<tr>
<th>Session/Term</th>
<th>Session Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercollegiate Athletics</td>
<td>$30.00 $15.00</td>
</tr>
<tr>
<td>(until September 1981)</td>
<td>$28.00 $14.00</td>
</tr>
<tr>
<td>Health Insurance (see Note 5)</td>
<td>$26.19 $ 8.73</td>
</tr>
<tr>
<td>- Regular</td>
<td>$26.19 $ 8.73</td>
</tr>
<tr>
<td>- Co-op</td>
<td>$ - $16.37</td>
</tr>
</tbody>
</table>

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 session or term:

<table>
<thead>
<tr>
<th>Session/Term</th>
<th>Session Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Federation of Students</td>
<td>$21.50 $10.75</td>
</tr>
<tr>
<td>- (see Note 6)</td>
<td></td>
</tr>
<tr>
<td>Student Society (see Note 7)</td>
<td>$10.00 $ 5.00</td>
</tr>
<tr>
<td>- Architecture</td>
<td>$10.00 $ 5.00</td>
</tr>
<tr>
<td>- Arts</td>
<td>$ 5.00 $ 2.50</td>
</tr>
<tr>
<td>- Engineering</td>
<td>$ - $ 4.00</td>
</tr>
<tr>
<td>- Env. Studies</td>
<td>$ 4.50 $ 2.25</td>
</tr>
<tr>
<td>- HKLS</td>
<td>$ 6.00 $ 3.00</td>
</tr>
<tr>
<td>- Int. Studies</td>
<td>$ - $ -</td>
</tr>
<tr>
<td>- Mathematics</td>
<td>$ 5.00 $ 2.50</td>
</tr>
<tr>
<td>- Optometry</td>
<td>$ 4.00 $ 2.00</td>
</tr>
<tr>
<td>- Science</td>
<td>$ 4.00 $ 2.00</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 session or term:

<table>
<thead>
<tr>
<th>Session/Term</th>
<th>Session Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>WPIRG (see Note 8)</td>
<td>$ 5.00 $ 2.50</td>
</tr>
<tr>
<td>(until September 1981)</td>
<td>$ 4.00 $ 2.00</td>
</tr>
<tr>
<td>Sanford Fleming Foundation (see Note 9)</td>
<td>$ - $ 2.50</td>
</tr>
<tr>
<td>Radio Waterloo (see Note 10)</td>
<td>$ 6.00 $ 3.00</td>
</tr>
<tr>
<td>Imprint (see Note 11)</td>
<td>$ 3.50 $ 1.75</td>
</tr>
</tbody>
</table>

Note 1 - Session/Term
Session refers to the eight month (September-April) period of study. Term refers to the four month period of study for students registered in a) Co-operative programmes, and b) the Winter or Spring terms of regular programmes.

Note 2 - Co-operative Fee
Additional tuition fee assessed to all co-operative programme students registered in more than two term course equivalents per term.

Note 3 - Unit Course Fee
The fee assessed at $194.00 for each full course at a weight of 1.0; at $97.00 for each half or 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 Authorizations 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 programme 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 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) or 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 the International Development Research.
Centre, 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 a person whose parent or guardian was admitted to and remains in Canada under clause 10 (c) of the Immigration Act, 1976 who is wholly dependent upon such a parent or guardian for support and who is:

a) Under 18 years of age, or
b) 18 years of age or over and in full-time attendance at an eligible post-secondary institution.

“Guardian” means a person who has been appointed by order of a court as the legal guardian of a child in place of a parent.

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 $11.93 per term.

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 - 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 for the term or session as indicated on pages 5 to 8 of this Calendar.

Note 7 - 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 for the term or session as indicated on pages 5 to 8 of this Calendar.

Note 8 - 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 for the term or session as indicated on pages 5 to 8 of this Calendar.

Note 9 - Sandford Fleming Foundation (S.F.F.)
An organization dedicated to the development of co-operative engineering education.

This fee applies to Engineering students only and is voluntary, refundable and not a requirement for registration. Requests for refunds should be directed to the on-campus Engineering Society office, within three (3) weeks after the start of lectures for the term as indicated on pages 5 to 8 of this Calendar.

Note 10 - 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 or session involved as indicated on pages 5 to 8 of this Calendar.

Note 11 - 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 or session involved as indicated on pages 5 to 8 of this Calendar.
Note 12 - Other Costs
The fees shown do not include the costs of text books, class notes, Correspondence Programme tape or kit deposits, mandatory supplies, certain accommodation or other costs associated with field trips, or other similar expenses.

Miscellaneous
Supplemental Examination – Each Paper $10.00
Presiding Fee
(at outside centre half day) $10.00
Returned Cheques – Handling charge (plus late registration penalty as applicable) $15.00
Duplicate Fee Statement or Tax Receipt (per request) * $ 2.00
Transcript of Record (per request) $ 2.00
Replacement of lost Identification Card $ 5.00
Replacement of lost Health Insurance Card $ 5.00

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 programme may apply to residence fees only those funds which are received during the term in question. See page 23 for further information.

Income Tax Receipts
Receipts for income tax purposes for fees paid covering the academic period 1 May 1981 to 30 April 1982 will be mailed after 1 March 1982 to the home address on record.
Scholarships
Bursaries,
Prizes and
Financial Aid
Scholarships, Bursaries, Prizes 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 Programme (OSAP) and other forms of government aid to students. As well, the office administers the University's Undergraduate Scholarship and Bursary Programme 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.

Undergraduate Scholarships

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:

Chemistry Scholarships:
Students must write the Chem 13 News Exam.

Mathematics:
Students must write the Descartes Mathematics Competition.

Physics:
Students must write the Sir Isaac Newton Physics Contest

Engineering:
Students must write at least one of the above 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, except in the Faculties of Engineering and Mathematics where special applications are required.

University of Waterloo Alumni Association Scholarships
Entrance Scholarships with a maximum value of $4,600, of which $1,200 is allocated in the first year and $1,200 may be allocated in each of three additional years, will be awarded from an endowment fund established by the Alumni Association to outstanding students entering each Faculty. The criteria for awarding and renewing these Scholarships will be determined by the awarding Faculty.

The Alberta Optometric Association Scholarships
The Alberta Optometric Association presents two scholarships in the amount of $250 to each of two students admitted to Year 2 (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.

Allied Chemical Canada Limited Scholarship
This scholarship is awarded annually to one student not otherwise holding a scholarship, entering final year of undergraduate studies in Chemical Engineering or majoring in Chemistry. Based on merit, the award is in the amount of $750 and made with the recommendations of both the Faculties of Engineering and Science.

The AOCO Canada Limited Scholarship
AOCO Canada Limited presents annually a scholarship to a Canadian student admitted to Year 2 (the First Professional Year) of the School of Optometry. This award is made on the basis of academic achievement. The value is $600.

Alfred Armbrust Memorial Scholarship
The $1,000 scholarship is awarded annually to an outstanding student entering the Faculty of Engineering.

Arts Faculty Scholarships
The Faculty of Arts is offering several entrance and upper year scholarships in recognition of academic excellence. Entrance scholarships, awarded on the basis of secondary school performance and recommendations, are valued at $1,750. of which $1,000 is allocated for first year and an additional $750 for second year, if the student maintains an A average. Upper year scholarships valued at $750 are awarded on the basis of the previous year's standing and require the recommendation of the candidate's department. Special awards may be made at the
The discretion of the Faculty of Arts Scholarship Committee, which Committee is responsible for both regular and special awards.

**Association of Professional Engineers Entrance Award**
The Association of Professional Engineers of the Province of Ontario provides a $500 Entrance Award to the student who has the highest academic standing in Year 5 examinations and who is entering an accredited engineering programme at the University of Waterloo.

**Association of Professional Engineers Undergraduate Scholarship**
The Association of Professional Engineers of the Province of Ontario offers three annual scholarships of $250, one to the student in each of the first, second and third years in an accredited engineering programme who has the highest average in the examinations for his year.

**The Bausch and Lomb Optical Company Limited Award for Clinical Proficiency**
Bausch and Lomb Optical Company offers a prize to the student in the fifth professional year judged to have demonstrated the highest levels of proficiency in clinical activities. The prize is a Greens Refractor or equivalent ophthalmic instrumentation to the approximate value of $2600.

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

**The Bausch & Lomb Soflens O.D. Awards**
Two $500.00 scholarships are awarded to students who demonstrate need and academic excellence in the preliminary courses related to the contact lens programme. The recipients should not be receiving any other scholarships for the academic year.

**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 programme. To be eligible for one of these scholarships a student must obtain an average of 75% in the previous term’s or year’s examinations.

**The British Columbia Optometric Association Scholarships**
The British Columbia Optometric Association presents two scholarships in the amount of $300 to each of two students admitted to Year 2 (the first Professional Year) of the School of Optometry. These awards are made to students who are residents of British Columbia. They are awarded on the basis of academic achievement.

**Canada Packers Limited Awards**
There are two $500 awards. The awards are presented to third-year students in each of Chemical Engineering and Mechanical Engineering, and are based on high academic achievement, extra-curricular activities, and personal characteristics.

**Centennial Optical Scholarships**
The Centennial Optical Company offers two scholarships in the amount of $250 to each of two students admitted to Year 2 (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.

**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 Year 1 are made on the basis of performance on an examination held in April. Students entering upper years in Honours Chemistry (co-operative or regular system) are automatically considered for the award.

**Chemistry Scholarships**
Scholarships in varying amounts are awarded to students entering first year Chemistry. Based on Grade 13 results and performance on the CHEM 13 NEWS Contest.

Upper Year Scholarships are also offered to students on the basis of performance at UW.

**Concordia Club Scholarship in German**
A scholarship in the value of $300 will be awarded annually in the Faculty of Arts by the Kitchener-Waterloo Concordia Club to promote and encourage the study of German language and literature.
Charles E. De Leuw Transportation Scholarship  
The De Leuw Cather and Company of Canada Limited, in memory of the company's founder, is making an annual award available to a 4th 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. The Senate Committee on Scholarships and Student Aid will work in conjunction with the Department of Civil Engineering in determining the winner. Application forms should be requested from the Awards Office.

Datacrown Computer Science Scholarship  
The scholarship, valued at $300, is awarded to the outstanding student entering fourth year Computer Science (Co-op) who has demonstrated both academic excellence and outstanding leadership.

Rene Descartes Scholarships, Fellowships, and Bursaries  
Enterance 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 Competition and submit an application form. These may be obtained from the Head of Mathematics or the Guidance Counsellor in the secondary schools. 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. No application is required.

Dow Chemical of Canada Scholarship in Chemical Engineering  
$750 is awarded to the student and a grant-in-aid of $250 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.

Randy Duxbury Memorial Scholarship  
The $600 scholarship is awarded to a student in third year Chemical Engineering who has high academic standing and who has demonstrated a strong interest in extra-curricular activities and athletics. Apply in writing to the Awards Office.

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.

Environmental Studies Faculty and Staff Scholarships  
A limited number of entrance and 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. Further information may be obtained from the Awards Officer.

The William Feinbloom Low Vision Award  
This is a Low Vision Trial Set awarded to the final year student who has shown excellence in both the didactic and the clinical aspects of Low Vision care.

General Motors Scholarships  
The General Motors of Canada Limited Scholarship Award of $1,000.00 is offered annually to students enrolled in an Engineering, Mathematics with Business option, Honours Computer Science or a Business related programme of study. In addition, applicants must have a minimum average of 80% or be on the Dean's list. They must be entering their penultimate or final year of study and they must have career objectives applicable to the automotive industry. Recipients will be selected on the basis of academic performance, career goals, demonstrated leadership ability, involvement in outside activities and a personal interview with representatives of the Company. Recipients must serve an internship with GM during the summer preceding the academic year in which the award is payable. For those who qualify the award is renewable.

Don Hayes Award  
This award is given annually to a deserving undergraduate student who has a minimum of B average standing and who is involved in athletics or the sports training function in the University or the community. Letters of application, including the names of references, should be forwarded to the Awards Officer.

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 Scholarships.
Human Kinetics and Leisure Studies Faculty and Staff Scholarships
A limited number of entrance and upper year scholarships in varying amounts are made available each year. Scholarships are based on academic achievement in the previous year.

Huron County Scholarships
Huron County Council is offering two $150 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
The value is $100 and a one-year membership in the Institution. It is awarded annually to the best all around fourth-year student in the production and manufacturing option of Mechanical Engineering, and is 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.

Lynn Holmes Memorial Award
It is awarded 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 programme.

Ready Mixed Concrete Association of Ontario Scholarship
Two scholarships of $250.00 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.

Sir Isaac Newton Scholarships
The Department of Physics awards two freshman Sir Isaac Newton (SIN) Scholarships annually, based mainly on the results of the SIN Physics test written in Ontario Secondary Schools. Values are $2,000 and $1,500 respectively for one year, with an additional $1,950 over three more years as a SIN Assistant. 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 $500, $400, $300, $200 in each year. No application is necessary to be considered for the scholarship in the upper years. (These scholarships may be subject to the condition that no other scholarships are held concurrently).

Sir Isaac Newton Assistantships
The Department of Physics offers Sir Isaac Newton (SIN) Assistantships to recognize and encourage academic excellence in students proceeding towards an Honours Physics degree. The awards are normally made to freshmen, and are value at $2,600 payable $650 per year. Renewal is based on satisfactory academic standing. About ten new awards are given each year, based mainly on the results of the SIN test mentioned above. Recipients of this award are required to undertake a minor academic or research project within the Department.

Ford S. Kumpf Scholarship
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. Value: $1,000 for Year One and an additional $1,000 for Year Two if the recipient maintains first class honours standing.

Friedrich Lehner Scholarship
This scholarship will be awarded to a third or fourth year undergraduate student of German Literature and Language. The value of this award is $100 and is provided annually by Mr. Friedrich Lehner of Lehner Travel Service, Toronto, Ontario, Canada.

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 coop Geography student who is completing the 48 term. Candidates are selected on the basis of good academic standing, work-term performance, and broad involvement in the coop programme and class activities.

Mediacom Inc. Scholarship
An annual scholarship of $250 awarded to a third or fourth year student in Urban and Regional Planning. Based on high academic standing and an interest in planning.

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.
Scholarships, Bursaries, Prizes and Financial Aid
Undergraduate Scholarships

Optometry Scholarships
The School of Optometry awards scholarships annually to students admitted to the School of Optometry from Year 1 Regular Science at the University of Waterloo. These awards will be made chiefly on the basis of scholastic achievement and as funds permit in Year 2 Optometry, Year 3 Optometry, Year 4 Optometry and Year 5 Optometry.

The 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 2, School of Optometry. Six scholarships are available, each of a total possible value of $1,200, being $300 per year over the four professional years (Years 2, 3, 4 and 5) 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 students who are residents of one of the Western provinces. The various Provincial Optometrical Associations are consulted in awarding these Bursary Scholarships.

Applications should be submitted to The Student Awards Office before Sept. 15 of each 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.

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.

The Saskatchewan Optometric Association Scholarships
The Saskatchewan Optometric Association presents two scholarships in the amount of $300 to each of two students admitted to Year 2 (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.

Science Faculty Scholarships
A limited number of Entrance Scholarships are awarded to students entering General Science. For Chemistry awards, see Chemistry Scholarships and Assistantships. For Physics, see Sir Isaac Newton Scholarships.

Small Fellowship
The award of $300 is based on work in the fourth year (BArch) programme, leadership ability and academic and design excellence.

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.

Ukrainian Credit Union "Buduchnist" Scholarship in Ukrainian Studies
The Scholarship of $106 will be awarded annually to an outstanding full-time student who attains the highest academic standing in a Ukrainian course.

R. H. Walters Award
A $100 award, based on academic excellence, is made to the most outstanding student in the graduating year of the Honours Psychology programme (Joint Honours included) or equivalent. The Undergraduate Affairs group, Department of Psychology, shall select and recommend the award winner to the Senate Committee on Scholarships and Student Aid, which shall approve the nominee.

University of Waterloo Engineering Scholarships
Entrance scholarships, ranging in value from $1,200 to $1,500 for first year with some renewable in subsequent years to a total value of $3,800, are awarded to students on the basis of outstanding ability in mathematics and science and demonstrated potential for success in engineering. The following criteria will be used in allocating these awards:
- minimum overall average of 85% in Grade 13;
- performance in the special Waterloo tests (Descartes Mathematics, Sir Isaac Newton Physics and CHEM 13 NEWS competitions);
- students must write at least one and are encouraged to write all three of these tests;
- principal's recommendation and other supporting material

Students must submit an application form which can be obtained from the Awards Office.

Upper Year Awards, called Undergraduate Research Scholarships and Undergraduate Research Assistantships, are valued at $600 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 - 4A terms. The Scholarships are normally awarded automatically at the beginning of each term. To be eligible for an Assistantship a student must apply at the beginning of the term and show...
Scholarships, Bursaries, Prizes and Financial Aid

Undergraduate Scholarships

Work Term Report Awards

an interest in a particular field. The Assistantship is made available through the professor pursuing research in that area.

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.

University of Mannheim Exchange Scholarship
Travel, accommodation and living allowance are provided for a student of the “Waterloo in Germany Programme” for a year of study at the University of Mannheim.

University of Waterloo - Waterloo County Entrance Scholarships
$700 is awarded to the top eligible student from each of the Waterloo County secondary schools for first-year study at the University. Decisions are based on recommendations from the secondary schools.

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-ordination and Placement in consultation with the appropriate academic department. Reports considered confidential are not eligible.

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

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

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

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

Dofasco Awards
Three awards of $100 each per term to General Engineering students following their first work term.

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

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

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

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

MacLaren Engineers Planners & Scientists Inc. Awards
Three awards of $100 each to second, third and fourth year Civil Engineering students.

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

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

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

Union Miniere Explorations and Mining Corp. Ltd. Awards
Three awards of $100 each to second, third and fourth year Applied Geology students.

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

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

Sandford Fleming Foundation Awards
Awards of $100 each to second, third, and fourth year students in those classes of each undergraduate department of Engineering in which industrially sponsored awards have not yet been established.
St. Jerome's College Awards

Upper Year Scholarships

St. Jerome's College Upper Year Scholarships
St. Jerome's College is offering Upper Year Scholarships in order to recognize and encourage academic excellence. Upper Year Scholarships in Arts will be awarded on the basis of a student's academic standing in the previous year and the recommendation of the College Faculty. These scholarships vary in amount to a maximum of $750.

The C. L. Siegfried, C.R. Scholarship
The scholarship has been established in recognition of Reverend C. L. Siegfried, C.R., President of the University of St. Jerome's College from 1959 to 1965 and 1972 to 1979. It is given annually to the student entering the fourth year of an Honours programme at St. Jerome's who best demonstrates the academic excellence Father Siegfried consistently encouraged at St. Jerome's College. Value: $800.

The Father John Bullbrook Scholarships
These awards are the gift of the members of the Congregation of the Resurrection residing at St. Jerome's College given in honour of the late Rev. John Bullbrook, C.R, who taught at the College. Five annual scholarships of $150 each are awarded to deserving students who combine academic excellence and contribution to College life. Application forms are required.

The Father Anthony Firetto Scholarships
These awards are the gift of the members of the Congregation of the Resurrection residing at St. Jerome's College given in honour of the late Rev. Anthony C. Firetto, C.R, who taught at the College. Five annual scholarships of $150 each are awarded to deserving students who combine academic excellence and contribution to College life. Application forms are required.

The Newman Scholarships
Two awards of $250 each are provided annually to students in their graduating year who have demonstrated consistent academic excellence and contribution to College life.

Gladys and Norman Ralter Bursary
$800 is awarded annually to an upper year student registered at St. Jerome's College on the basis of high academic standing and financial need. Application forms are available from the Office of the Dean of the College and must be submitted by August 1.

Year 1 Admission Scholarships

Faculty of Arts
All St. Jerome's Arts applicants are eligible for scholarships from $700 to $1,000. No application for a scholarship is necessary and consideration is based on the applicant's admission average. Those with averages of 80% or better are considered for a scholarship. Scholarships of $1,000 would require an 85% average or better, with lesser amounts available to those students with averages between 80% and 84.9%.

Assessment of these awards will be based on preliminary grades submitted to the Ontario Universities' Application Centre by the candidates' secondary schools in April and will be awarded in June along with the candidates' offers of admission to St. Jerome's College, University of Waterloo.

Those students who receive admission scholarships are eligible for scholarships in upper years provided that high academic standing is maintained.

Faculty of Mathematics
First year Mathematics applicants are eligible for scholarships from $300.00 to $850.00 if they select St. Jerome's as first choice on the application for admission and write the Descartes Mathematics Competition sponsored by the Faculty of Mathematics. The exact amount of the scholarship is determined by considering the Descartes score and the admissions average.

Upper Year Fellowships are available in limited numbers.

The Founder's Scholarships
These scholarships, with a maximum value of $900.00 each, have been established in memory of Rev. Louis Funcken, C.R. (1883-1890), founder of St. Jerome's College. One graduate from each of St. Mary's High School, Kitchener, St. Jerome's High School, Kitchener, and St. John's College, Brantford will receive this scholarship. To be eligible, applicants must select St. Jerome's, Arts or Mathematics, first choice on the application for admission and possess an admissions average of at least 85%.
The C. L. Siegfried Bursary
This fund has been established in recognition of Rev. C. L. Siegfried. Bursaries in varying amounts will be awarded to students registered at St. Jerome's College who demonstrate high academic standing and financial need. Application forms are available from the Office of the Dean of the College and must be submitted by August 1.

Undergraduate Awards

St. Jerome's College Awards
Five awards in varying amounts are awarded annually to Year 1 and upper year students registered at St. Jerome's College who combine high academic achievement, and financial need. Application forms are required.

The Father Tony Fretto Bursary Fund
This fund was established and is administered by the Students’ Union in memory of the late Rev. Anthony C. Fioretto, CR, who taught at the College. The Fund makes $100 available annually to a student or students registered in the College and majoring or honouring in Psychology. Application should be made to the Chairman of the Psychology Department.

Awards for Candidates for the Priesthood
The following awards are available for students studying for the priesthood who demonstrate academic excellence and financial need. Application forms are required.

The Schill Awards
Two awards in the value of $300 are awarded annually to students registered through St. Jerome's College in any year.

Awards for Candidates for the Congregation of the Resurrection:

The J. J. Gnam Award
One award annually in the value of $300.

The M. Wintemeyer Award
One award annually in the value of $300.

The August and Ann Lang Award
One award annually in the value of $300.

Awards for Candidates for the Diocese of Hamilton

The Kehoe - Cosgrove Awards
Two awards annually in the value of $200 each.

The Monsignor J.A. O'Brien Bursary
One award annually with a value of $200.

Renison College Awards

A number of scholarships and awards are available to Renison students. For the most part they are restricted to students who have enrolled in their studies through the College. A limited number are available to students who live in residence but are following academic programmes elsewhere in the University. The Renison Scholarships and Awards Committee has a small amount available for loans or grants to students facing serious financial problems. Information on scholarships, bursaries, awards and other financial aid made available through the University of Waterloo may be obtained from their Awards Office.

Application forms for Renison scholarships and awards are available from the College Registrar.

A. W. Rees Memorial
This award was established by College personnel in memory of the first principal of the College. The award is made annually to an outstanding student for an all-around contribution to the life of the College.

Dunker Family Centennial Scholarship
This scholarship was established by Mr. Carl Dunker, one of the founders of the College. It is granted annually to a resident student on the basis of their contribution to the life of the College and good academic proficiency.

Leonora Monk Scholarship
This scholarship was bequeathed by Miss Leonora Monk. It is awarded annually to a Renison student for excellence in academic performance. Some consideration is given to financial need in making the award.

Willis Theological Scholarship
This scholarship is awarded annually to a graduating student of the College who has registered for theological studies.

The Renison College Entrance Scholarship
Two scholarships, each valued at one-half the tuition fee for one session, are provided annually to students entering the programme in Social Development Studies. They are granted on the basis of excellence in academic performance with some consideration of financial need.
Parish of St. Aidan-Elmira Scholarship
This $200 scholarship, established by the Anglican Parish of St. Aidan, is awarded on the basis of good academic performance to a graduate of Elmira District Secondary School entering the first year of full-time study in the Faculty of Arts and registering at Renison College. If no such individual applies, the scholarship may be granted to an applicant from any Waterloo County secondary school.

Renison College Achievement Scholarships
The three scholarships are awarded annually to a student in each of the three upper years of study. They are available to students in the Social Development Studies programme and to students following the General Arts Programme of the University of Waterloo who have registered through Renison College.

Fourth Year Scholarships for Honours Students
Renison College will annually award a tuition scholarship to specially selected students entering the fourth year of an Honours or Joint Honours Programme in Social Development Studies. A maximum of ten scholarships are available.

Bursaries

Note
Bursaries are awarded on the basis of academic standing (minimum B average) and evidence of financial need. Students with student visas who have not been in Canada for more than one year will not normally be considered. Applications must be submitted to the Awards Office by the end of the first month of first term unless otherwise indicated. All bursaries are applied for on a common University of Waterloo application form unless otherwise stipulated.

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. The recipient is determined by the Senate Committee on Scholarships and Student Aid in conjunction with the Faculty of Mathematics.

ATA Trucking Industry Educational Foundation Bursaries
The Automotive Transport Association Trucking Industry Educational Foundation was established in 1958 by a group of transport companies who decided to divert monies formerly spent in customer gift-giving at Christmas to bursaries for deserving and needy students. The funds are to be distributed to students in all faculties who, because of extenuating circumstances, are deserving of financial help and would not be in a position to continue their studies without some assistance.

Atkinson Charitable Foundation Bursaries
The Atkinson Charitable Foundation has established a bursary programme 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.

Bechtel Canada Limited Bursary
Bechtel Canada Limited has made available two bursaries, each in the amount of $500 to be awarded to two students entering first 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.

Birks Family Foundation Bursary
The Birks Family Foundation has established a plan of annual contributions to the Student Aid Fund of recognized Canadian Universities for the creation of the Birks Family Foundation Bursaries. The Bursaries are awarded by the Foundation on the recommendation of the University Scholarship Committee and are not restricted to faculty or year and may be renewed. The number and amount of such awards may vary annually, depending upon the funds available for the purpose from the Foundation.

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

Central Optical Bursary
A bursary in the amount of $1500.00 will be awarded to a student who has successfully completed one or more years of the professional program. The award is to support student research under the direction of a faculty member of the School of Optometry. Application should be made through the Awards Officer of the University of Waterloo during March or April.
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 $150 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.

IBM Canada Bursary Program
IBM Canada Limited makes an annual grant of $2,000 for bursaries to students registered in a full-time course at the university who have satisfactory standing and who demonstrate financial need. Application may be made through the Awards Office.

Interprovincial Pipe Line Company Bursary
The Interprovincial Pipe Line Company Bursary Fund, of a total value of $2,000 has been established by Interprovincial Pipe Line Company to benefit students beyond the first year who are in need of financial assistance. The company has stipulated that 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.

J. P. Bickell Foundation Bursaries
The Foundation is making available a sum of money to be used in providing bursary assistance to Chemical Engineering and Earth Science students of good academic standing who need financial assistance.

J. G. Hagey Alumni Bursary
In honour of J. G. Hagey, President Emeritus of the University of Waterloo, the Alumni Association has, in recognition of his significant contributions to post-secondary education, established a bursary fund. Several bursaries to a maximum of $150 each will be awarded annually from the fund to students showing financial need. All students attaining a 60% or equivalent standing in their previous academic years and who have not entered Canada on a student visa are eligible to apply.

Canadian Federation of University Women - Kitchener-Waterloo
The Canadian Federation of University Women has established a bursary fund at the University of Waterloo to assist one or more women in second, third or fourth year, who have attained Second Class Standing and are in need of financial assistance. Preference will be given to women not holding tuition scholarships.

Litton Systems Bursary
Two bursaries, valued at $250 each, are offered annually by Litton Systems (Canada) Limited. The bursaries may be awarded to students in the Faculty of Engineering with preference being given to those in the electronic or electromechanical fields. They are intended to provide financial assistance to undergraduates in need and may be held concurrently with other awards where the need exists.

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. Applications should be made in writing to the Associate Dean, Faculty of Human Kinetics and Leisure Studies.

Procor Limited Bursary
A bursary, to the value of $150 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. Where the need exists the bursary may be held in conjunction with other awards.

The Minnesota Mining and Manufacturing of Canada Limited Bursaries
Two bursaries, to the value of $500 each, are offered annually by the Minnesota Mining and Manufacturing of Canada Limited. The bursaries may be awarded to any full-time undergraduate student at the University who has a good academic record and is in need of financial assistance for continued studies.

Proctor and Gamble Student Bursary Fund
A number of bursaries are available to assist needy students in any year or faculty. The bursaries are awarded to residents of Canada on the basis of academic standing and financial need.

Rockwell International of Canada Limited, Collins Canada Division Bursary
A bursary of $200 to a deserving undergraduate 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 second year.
Alan W. Shattuck Memorial Bursaries
Normally 2 awards of $400-$500 are awarded annually on the basis of academic standing and financial need to students in fourth year Civil Engineering. Funds made available by associates of Mr. Shattuck in recognition of his contribution in both pollution and water control resources.

Waterloo Young Men’s Club Bursary
A bursary of $100 awarded annually to a full-time student who is a permanent resident of Waterloo, has good academic standing and requires financial assistance.

Prizes

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

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 programme who, having received honours, has obtained the highest standing in the final examinations of the current academic year. Included with this award is a gift of technical books valued at approximately $50.

The 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.

The Bobby Bauer Memorial Awards
The Bobby Bauer Memorial Foundation makes awards annually to deserving undergraduate students who demonstrate proficiency in athletics. Applications are available from the address below and must be submitted to the Foundation by Sept. 30.
Bobby Bauer Memorial Foundation, 60 Victoria Street North, Kitchener, Ontario.

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

The Canadian Contact Lens Society Prize (value approximately $100)
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 practical application of Contact Lenses.

The 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:

a) 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 second, third and fourth years.

b) 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 second, third, and fourth years.

c) Two awards to final year students for academic excellence or proficiency in specified subjects.

d) In addition to the above, prizes are awarded for highest academic standing in certain second, third, fourth and fifth 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.
Allergan Canada Ltd., Pointe Claire, Que.
Canadian Optical Supply Co; Montreal, Que.
Eastern Optical, Dartmouth, N.S.
Gordon Contact Lenses, Inc., Rochester, N. Y.
Hyoron Canada Ltd., Etobicoke, Ont.
Kahn Optical Company Limited, Toronto, Ont.
KDS Optical, Toronto, Ont.
N & N Optical, Mississauga, Ont.
Plastic Contact Lens Co., Toronto, Ont.
Professional Optical Co., Willowdale, Ont.
Superlite Optical Co., Toronto, Ont.

The 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 $25 gift, are given to the student with the highest academic standing in the penultimate year of either course.

No application is necessary.
Classics Prize
The Classics Prize of $75.00 will be awarded annually to the student who attains the highest mark in either Latin 151/152 or Greek 100. To qualify for the prize the student must enroll in a further Latin or Greek courses at the 200 level.

The 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 $100 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. No application is necessary.

The Engineering Institute of Canada Student Prize
The E.I.C. Student Prize is awarded to a Student Member of the Institute in the year prior to the graduating year on the basis of the marks made in his academic year and his activities in the student engineering organization or in the local branch of a recognized engineering society.

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

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

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

The Sandford Fleming Undergraduate Travel Grants
The Sandford Fleming Foundation has established a number of travel grants to enable Engineering undergraduate students to present a paper at a technical conference. The paper must be authored or co-authored by the student and must be based on work done in the course of undergraduate study. Application should be made to the Awards Committee Chairman, The Sandford Fleming Foundation.

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.

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

The Percy Hermant General Proficiency Prizes (value $500 and $250)
The gifts of Sydney Hermant are awarded to the final year students in the School of Optometry ranking first and second in general proficiency.

The K-W Optical Company Limited Prizes
Awards are made to the two students in each of the second, third and fourth professional years 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.

The Bruce Wyler Kelly Memorial Prizes
These prizes are awarded in the General Science Programme at the end of second year to two students, one with Biology as the major subject and with the highest standing in Biology, and one with Chemistry as the major subject and with the highest standing in Chemistry. The minimum requirement is B standing in the average of these courses.

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

The J. R. Matthews Memorial Prize in Biology
Value: $200. The colleagues, friends and relatives of the late Dr. Jonathan R. Matthews offer an annual prize to the student who graduates from the Honours Biology (or Biology/Chemistry) programme with the highest overall average in third and fourth year courses.
The Jerome T. Miller Memorial Prize
This 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 programme which combines studies in Chemistry and Physics.

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

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

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

Ontario Association of Architects Third Year Award
An award of $250 is based on studio performance in third year and overall performance up to third year.

Pennsylvania German Folklore Society of Ontario Prize in German
This prize of $50 will be awarded annually to the student in the Faculty of Arts, born in Canada, who has made the most progress in German during the year.

Political Science Third Year Prize
This prize of $50 will be awarded by the Political Science Department to the fourth year Political Science major with the highest cumulative average in his or her Political Science courses at the end of third year.

No application is necessary.

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

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.

Society of Chemical Industry Award
A gold key is awarded by the Society to the student with the highest standing in the final year of Chemistry.

Spanish Book Prizes
Three books will be awarded annually to the most deserving students in Beginning, Intermediate, and Honours Spanish.

The J. C. Thompson Memorial Prize (value $125)
The 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 302, 312, etc.).

Toronto Chapter of Architects Award
The award, valued at $4,000.00, is available to students registered in the final year of Architecture. Students must apply to the Director of the School of Architecture by December 31.

Vodnoy Clinical Optometry Award for Orthoptics
The gift of Bernard E. Vodnoy, OD., DOS, FAAO. to the final year student who demonstrates proficiency in orthoptics and vision training. The award consists of orthoptic instruments of an approximate value of $250.

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.
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. Students wishing to obtain assistance from one of the following funds should apply to the Awards Office.

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 4 months are available to students in all faculties.

Arts Student Union Loan Fund
Short-term, interest-free emergency loans are available to full-time undergraduates who are members of the Arts Student Union. Loans are to a maximum of $200 for a period of up to 90 days.

The Adelaide Detwellar Student Loan Fund
This loan fund has been established by Mr. J. R. Detwellar in memory of his mother, Adelaide Detwellar, to provide short-term loans, interest-free, to students who may be confronted with unexpected expenses during their academic year.

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

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. It is intended to provide short-term loans, interest-free, to students who may be faced with unexpected expenses during their academic year.

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 Programme. The Society’s contribution is intended to provide short-term, interest-free loans to Mathematics students who have been faced with unexpected expenses during their academic year.

Environmental Studies Society Loan Fund
Short term interest-free 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.

Ginny Lee Memorial Fund
Students’ Council has set aside a sum of money to be used in assisting students by providing interest free, short term loans. It is intended that this fund be used only when other avenues of obtaining assistance have been tried unsuccessfully.

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.

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.

Co-operative Lecture Emergency Loan Fund
This fund was established by Canadian politician T. C. Douglas in 1970. It is intended to provide short term, interest free loans to needy students who have been faced with unexpected expenses during their academic year.

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.

University of Waterloo Loan Fund
Loans up to $200 for a maximum of 90 days are available to full-time undergraduate students experiencing short-term financial difficulty.

The 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 students at the University who are experiencing temporary financial difficulty.
Engineering Students Memorial Loan Fund
This memorial loan fund, established by the Sandford Fleming Foundation in 1979, is maintained by the Foundation in order to provide short-term loans, interest free, to Engineering undergraduate students confronted with unexpected expenses during their academic terms or their work terms. The loans are normally for $100 or $200 for up to 90 days. Application should be made to the University Awards Officer.

The fund is to represent contributions received from classmates, friends and other interested donors in memory of students who lost their lives while enrolled in the Engineering Faculty, and while at the University or on their work terms.

Alpay - Nicoll Memorial Loan Fund
Established by the Sandford Fleming Foundation in memory of 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.

Government Assistance Programmes
The Ontario Student Assistance Programme (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 the student and his/her family. Although assistance is not based on academic standing, students are expected to make satisfactory progress in their studies.

OSAP consists of the following four plans:
1) Ontario Study Grant Plan;
2) Canada Student Loans Plan;
3) Ontario Student Loans Plan;
4) Ontario Special Bursary Plan.

1) Under the Ontario 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 at the graduate or professional level, or to students 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 60% 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 required.

Further details and application forms for the above are available in the 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.
The Department of Co-ordination and Placement
Department of Co-ordination and Placement

Director
R. J. Wieser, BE (Sask), PEng

Associate Directors
B. A. McCallum, BA (W. Ont.)
J. C. Wilson, BScCE (New Br.), PEng

Program Administrators
D. H. Copp, BASc (Toronto), PEng
R. A. Fuller, BA (W. Ont.)
J. W. Hoag, BArch (Toronto)
R. A. Klawitter, BA (W. Ont.)
R. A. Pullin, BSA (Toronto)

Career Planning Administrator
T. H. Fitzgerald, BA (St. Lawrence)

Operations Administrator
J. F. Westlake, BASc, MASc, PhD (Waterloo), PEng.

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

Placement Co-ordinator
F. M. Ruszer, BA (Guelph)

The Department of Co-ordination and Placement is responsible for the work-term aspect of all Co-operative programmes, and for assisting all students at the University in career planning and obtaining employment upon graduation. The staff includes professional personnel who have extensive business and industrial experience.

Co-ordinators, Co-operative Education
D. J. Beaupre, BComm (Loyola), CA
C. W. Bech-Hansen, BA (Sask.), MSc (Br. Col.)
G. P. Berthin, BSc (Manitoba), PEng
L. R. Bricker, BSc, MSc (Waterloo)
J. A. Calder, BASc (Br. Col.), PEng
W. G. Clapham, BMath (Waterloo), MBA (York)
W. G. Cole, BASc (Toronto), PEng
W. G. Dailey, BArch (Liverpool)
M. O. Deschenes, BA, BEd (Queen's)
G. P. Dobbin, BASc (Toronto), PEng
G. G. Ellsworth, BA (Princeton)
A. T. Girard, BASc (Toronto), PEng
R. A. Grant, BSc (Queen's), PEng
D. S. Harris, BEng (McGill), PEng
H. Hilderley, BA (York)
C. M. Johnson, BA (Queen's)
A. L. Lind, BSc (Queen's), PEng
A. F. MacKinnon, BComm (Acadia)
R. Matocyk, BASc (Toronto), PEng
R. McDowell, BSc (Sask.), PEng

The Co-operative Plan
Co-operative education is based on the principle that during the undergraduate years an academic programme 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 not in any 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 inestimable 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, and not in a random and uncertain manner, but 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 Department of Co-ordination and Placement. 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 1 students enrol in September and spend the first term together at the University. As indicated on the chart, they rejoin as a class for the last term to complete their course work and graduate together. In some programmes such as Engineering, Mathematics and Science, 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. All other programmes shown on the chart are single stream programmes where no choice is available in Year 1. Variations may be
## Work-Study Sequence

### Programme (By Faculty)

<table>
<thead>
<tr>
<th>Programme</th>
<th>Stream 1-1A</th>
<th>Stream 2-2A</th>
<th>Stream 3-3A</th>
<th>Stream 4-4A</th>
<th>Stream 5-5A</th>
<th>Stream 6-6A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arts</td>
<td>Regular off term</td>
<td>Reg. 2B</td>
<td>3A</td>
<td>3B</td>
<td>4A</td>
<td>4B</td>
</tr>
<tr>
<td>Anthropology</td>
<td>1A 1B</td>
<td>2A</td>
<td>2B</td>
<td>3A</td>
<td>3B</td>
<td>4A</td>
</tr>
<tr>
<td>Psychology</td>
<td>Regular off term</td>
<td>2A</td>
<td>2B</td>
<td>3A</td>
<td>3B</td>
<td>4A</td>
</tr>
<tr>
<td>Economics (Applied)</td>
<td>Regular off term</td>
<td>Reg. 1B</td>
<td>2A</td>
<td>2B</td>
<td>3A</td>
<td>3B</td>
</tr>
<tr>
<td>Economics (Management) and Chartered Accounting</td>
<td>Regular off term</td>
<td>2A</td>
<td>2B</td>
<td>3A</td>
<td>3B</td>
<td>4A</td>
</tr>
<tr>
<td>English</td>
<td>Regular off term</td>
<td>2A</td>
<td>2B</td>
<td>3A</td>
<td>3B</td>
<td>4A</td>
</tr>
<tr>
<td>Political Science</td>
<td>Regular off term</td>
<td>Reg. 2B</td>
<td>3A</td>
<td>3B</td>
<td>4A</td>
<td>4B</td>
</tr>
<tr>
<td>Engineering</td>
<td>Regular off term</td>
<td>2A</td>
<td>2B</td>
<td>3A</td>
<td>3B</td>
<td>4A</td>
</tr>
<tr>
<td>Chemical, Civil, Electrical Mechanical Stream 8</td>
<td>1A 1B</td>
<td>2A</td>
<td>2B</td>
<td>3A</td>
<td>3B</td>
<td>4A</td>
</tr>
<tr>
<td>Stream 4</td>
<td>1A</td>
<td>1B</td>
<td>2A</td>
<td>2B</td>
<td>3A</td>
<td>3B</td>
</tr>
<tr>
<td>Systems Design</td>
<td>1A</td>
<td>1B</td>
<td>2A</td>
<td>2B</td>
<td>3A</td>
<td>3B</td>
</tr>
<tr>
<td>Environmental Studies</td>
<td>Regular off term</td>
<td>2A</td>
<td>2B</td>
<td>3A</td>
<td>3B</td>
<td>4A</td>
</tr>
<tr>
<td>Architecture</td>
<td>Regular off term</td>
<td>2A</td>
<td>2B</td>
<td>3A</td>
<td>3B</td>
<td>4A</td>
</tr>
<tr>
<td>Geography</td>
<td>Regular off term</td>
<td>2A</td>
<td>2B</td>
<td>3A</td>
<td>3B</td>
<td>4A</td>
</tr>
<tr>
<td>Health Studies</td>
<td>1A 1B</td>
<td>2A</td>
<td>2B</td>
<td>3A</td>
<td>3B</td>
<td>4A</td>
</tr>
<tr>
<td>Kinesiology</td>
<td>1A</td>
<td>1B</td>
<td>2A</td>
<td>2B</td>
<td>3A</td>
<td>3B</td>
</tr>
<tr>
<td>Recreation</td>
<td>1A</td>
<td>1B</td>
<td>2A</td>
<td>2B</td>
<td>3A</td>
<td>3B</td>
</tr>
<tr>
<td>Mathematics</td>
<td>Mathematics</td>
<td>1A 1B</td>
<td>2A</td>
<td>2B</td>
<td>3A</td>
<td>3B</td>
</tr>
<tr>
<td>Stream 4</td>
<td>1A</td>
<td>1B</td>
<td>2A</td>
<td>2B</td>
<td>3A</td>
<td>3B</td>
</tr>
<tr>
<td>Chartered Accounting</td>
<td>1A</td>
<td>1B</td>
<td>2A</td>
<td>2B</td>
<td>3A</td>
<td>3B</td>
</tr>
<tr>
<td>Applied Math (Computer ScienceMinor), Applied Math (Engineering Option)</td>
<td>1A</td>
<td>1B</td>
<td>2A</td>
<td>2B</td>
<td>3A</td>
<td>3B</td>
</tr>
<tr>
<td>Pure Math (with Computer Science or Statistics)</td>
<td>1A</td>
<td>1B</td>
<td>2A</td>
<td>2B</td>
<td>3A</td>
<td>3B</td>
</tr>
<tr>
<td>Teaching</td>
<td>Regular off term</td>
<td>2A</td>
<td>2B</td>
<td>3A</td>
<td>3B</td>
<td>4A</td>
</tr>
<tr>
<td>Science</td>
<td>Science</td>
<td>1A 1B</td>
<td>2A</td>
<td>2B</td>
<td>3A</td>
<td>3B</td>
</tr>
<tr>
<td>Applied Chemistry Stream 8</td>
<td>1A</td>
<td>1B</td>
<td>2A</td>
<td>2B</td>
<td>3A</td>
<td>3B</td>
</tr>
<tr>
<td>Stream 4</td>
<td>1A</td>
<td>1B</td>
<td>2A</td>
<td>2B</td>
<td>3A</td>
<td>3B</td>
</tr>
<tr>
<td>Applied Physics Stream 8</td>
<td>1A</td>
<td>1B</td>
<td>2A</td>
<td>2B</td>
<td>3A</td>
<td>3B</td>
</tr>
<tr>
<td>Stream 4</td>
<td>1A</td>
<td>1B</td>
<td>2A</td>
<td>2B</td>
<td>3A</td>
<td>3B</td>
</tr>
<tr>
<td>Biology</td>
<td>1A</td>
<td>1B</td>
<td>2A</td>
<td>2B</td>
<td>3A</td>
<td>3B</td>
</tr>
<tr>
<td>Applied Earth Sciences</td>
<td>1A</td>
<td>1B</td>
<td>2A</td>
<td>2B</td>
<td>3A</td>
<td>3B</td>
</tr>
</tbody>
</table>

* Denotes work term where it appears on the chart

1. These work terms involve 6 months in a Secondary School & 2 months in the summer at Althouse College of Education. London.

2. Admission beyond 1A is possible only for the following terms: 1B - May, 2A - Jan., 2B - Sept., 3A - Jan.

3. Admission occurs by January for the 2B term.

4. Admission occurs by January for the 18 term.

5. Admission occurs by January for the 28 term.

6. Teaching occurs by January for the 2nd year courses.

7. Students cannot be admitted to co-op at the beginning of their first year.

---

X The Co-operative programme begins in 2A; however, admission is made to the programme at the time of the initial application to the university.

Y Admission beyond 1A is possible only for the following terms: 1B - Jan or May, 2A - Sept or Jan., 2B - May or Sept., 3A - Jan.

Z Admission occurs at the time of selection of 2nd year courses.

W Admission occurs by January for the 18 term. Students cannot be admitted to co-op at the beginning of their first year.
requested due to academic or work situations in upper years. Precise dates for the beginning and end of various terms are shown in the Academic Calendar.

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 programmes, no guarantee of employment can be made. The employment process is competitive, and academic performance, skills, motivation, maturity, potential, etc., will determine whether a student is offered a job. If a student is unplaced after the interview process, the Department will earnestly attempt to find suitable work experience.

Seeking Employment and Employer Interviews

Seeking Employment
Students are expected to seek employment through the interview process arranged by the Department of Co-ordination and Placement. Since channels of communication already exist, students may not seek employment directly with a participating co-operative employer unless specific arrangements are made with the Department. Students who have a job available before entering the co-operative programme must have the position evaluated by the Department before it may be considered to count towards the minimum requirements for graduation. Students intending to find their own jobs may not proceed with the normal application and interview process arranged by the Department.

Release of Information
For those students seeking employment through the interview process, copies of their Co-operative Student Record and academic grades are made available to prospective employers. In addition, resumes provided by students are made available to prospective employers. A file is kept on each co-operative student. This file includes the Co-operative Student Record, interim mark reports, Employer Evaluation of Co-operative Student forms, records of Co-ordinator interviews, etc. These files are confidential but will be made available, upon proof of identification, to each individual student. No information may be removed from the file. Copies of Employers Evaluation of Co-operative Student form will only be released 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 due to 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 programme and placed “On Own” by the Department.

Ranking Employers
Students are required to rank all employers by whom they are interviewed, except as provided under “Deleting Job Choices”. Ranking an employer indicates an agreement to work with that employer if placed there by the placement programme. Refusal to accept the job might result in a failed work term, in which case the Co-operative Student Record would have the notation: “Failed work term caused by refusal to honour a previous agreement”.

Deleting Job Choices
Normally students may delete up to two job rankings prior to submitting rankings for the placement process. If extenuating circumstances prevail, a student may delete more than two job rankings. In all circumstances, students must discuss the situation with a Co-ordinator prior to eliminating any rankings. Failure to discuss ranking deletions may result in the student being placed “On Own” by the Department of Co-ordination and Placement. Note that there may be instances where a student is not given a job ranking card by the employer because of an obvious mismatch of the student and the job which is discovered at the interview.

Work Terms

Quantity
Upon entry to a co-op programme a student is expected to follow the work-term/academic-term sequence appropriate for that particular programme. In some cases this may include as many as six work terms. 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 programme 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 programme from the time the programme begins. In those Faculties which offer both the regular and co-op programmes, the minimum number of related work terms required for a co-operative degree is normally four. In those Faculties offering only the co-op programme, the minimum number of work
terms normally equals the number of work terms available and remaining to the student in the programme 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-ordination and Placement. 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.

Academic Record for a Student Enrolled in a Co-operative Programme
The mark report of the student's last academic term will be released to the co-operative employer unless the student notifies the Department of Co-ordination and Placement to the contrary prior to the commencement of each work term.

Failure to Report to Employer
Failure to report may result in suspension from the programme and is recorded on the Co-operative Student Record form with the statement: "Failed work term caused by refusal to honour previous agreement".

Leaving Employer Without Prior Approval
Leaving a job without prior approval from the Department of Co-ordination and Placement may result in suspension from the programme and is recorded on the Co-operative Student Record form with the statement: "Failed work term caused by student terminating employment without prior approval".

Dismissal With Cause
Dismissal of a student by an employer will be thoroughly investigated by the student's Co-ordinator and may result in a notation on the Co-operative Student Record form: "Failed work term; dismissed for cause". The Department of Co-ordination and Placement may recommend to the Dean of the Faculty that consideration be given to suspending the student from the programme. However, if the investigation reveals no just cause, the student may proceed unhindered and will receive the notation N/A (Not Applicable) under the employer's evaluation.

Commitment
Normally, a minimum of two consecutive work terms with an employer is expected. Provision is allowed for such situations as: one-term jobs, economic uncertainty, relevance of the second term to a student's progress, and Co-ordinator discretion. Non-compliance with this requirement may result in a failed work term with a notation on the Co-operative Student Record: "Failed work term caused by refusal to honour a previous agreement".

Unsatisfactory Performance
Unsatisfactory performance by a student on a work term is investigated by the student's Co-ordinator. As a result of this investigation, if benefits from further professional training are questionable, the student may be required to withdraw from the programme.

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:
This indicates a condition where an on-own term is granted to a student for personal reasons. It may also be used to indicate that a student was unable to obtain suitable employment through the normal placement processes. If the student subsequently finds suitable employment, the Co-operative Student Record will be changed to record this fact.

On Own – Imposed by Department:
This indicates that a student has not complied with a programme regulation, such as a student missing interviews without just cause or failure to discuss deleting job rankings.

Standings and Appeals
Applicable to sections "Seeking Employment and Employer Interviews", and "Work Terms". The Department of Co-ordination and Placement which administers these Regulations and Procedures will first present any notation of "Failed Work Term", "On Own-Imposed by Department", or "Required to Withdraw" (as a result of unsatisfactory work term performance) to the appropriate Faculty examinations, promotions or standings committee for a 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. Where other than four are required by the University, this is stated in the calendar or in the individual student's file. However, employers may require additional reports from students as part of the job. Normally for a report to be considered a satisfactory work report 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”, “Satisfactory” or “Unsatisfactory”. Provision is made for students to upgrade Unsatisfactory work reports for re-evaluation by the beginning of the next academic term.

Graduation Requirements for Co-operative Programmes

**Work Terms**

**Quantity:**

Upon entry to a co-op programme a student is expected to follow the work-term/academic-term sequence appropriate for that particular programme. In some cases this may include as many as six work terms. 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 programme, 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 programme from the time the programme begins. In those Faculties which offer both regular and co-op programmes, the minimum number of related work terms required for a co-operative degree is normally four. In those Faculties offering only the co-op programme, the minimum number of work terms required for a co-operative degree is normally seven. Allowance can be made for personal considerations, educational opportunities, and other “On Own” conditions with prior approval from the Department of Co-ordination and Placement. However, “On Own” conditions do not count toward the minimum requirements for graduation.

Performance Evaluation:

In those programmes with a stated minimum number of work terms, this number is also the minimum number of satisfactory work terms.

In programmes where there is no stated minimum, the number of satisfactory work terms can be one less than the number of work terms remaining in the programme 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 programmes the submission of work reports is a requisite for graduation and generally the minimum number is four, and these four must be graded as satisfactory or better. Provision is made for students to upgrade unsatisfactory reports or submit new reports. Also provided for are situations where there are less than four work terms available to the students, as well as special conditions 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-op programmes, students must be registered as full-time students in the programme in all terms from point of entry through to the final academic term. The only exception occurs in programmes on a credit system where a student may have enough credits to be able to register as a part-time student in the final term.

Students registered in any of the co-op programmes should obtain the Department of Co-ordination and Placement's booklet "Regulations and Procedures for Co-operative Programmes". The booklet clarifies, emphasizes and supplements the University's requirements for co-op students as outlined in this Calendar.

Co-operative Degree Designation

Since Architecture and Engineering are mandatory co-op programmes, University of Waterloo graduates in those disciplines are known to have gone through the co-operative system. In programmes 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.
Career Planning and Placement

Students at all academic levels, regular or co-op, and in all faculties, are assisted in determining career paths and in obtaining employment on 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 techniques, resume and letter writing, and on how to take an interview. Career talks are held during the academic year and cover many areas of interest to students. 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 co-operative graduates interview students during a three-week period in January. Students in regular programmes, and postgraduate students, participate in a two-week interview period in November-December and in the January interviews. Also, summer and part-time employment are available for non co-op students.

The Career Planning and Placement offices are located on the first floor of Ira G. Needles Hall.

Waterloo Advisory Council

The Waterloo Advisory Council of the University of Waterloo was established in 1958 to bring guidance from industry to the University. The Council meets twice each year to discuss problems and make recommendations relative to the University's co-operative programmes.

J. R. Coutts (Chairman)
Teklogix Limited

G. A. Henderson (Vice Chairman)
General Foods Limited

W. B. Taylor (Secretary)
Ontario Cancer Institute

W. E. Baligent
Cannon Inc.

E. N. Banks
Dow Chemical of Canada Limited

C. T. Baumgartner
Gandalf Data Communications Limited

J. M. Beicher
Federal Ministry of Transport

D. J. Bernstein
Canadian General Electric

P. J. Boyd
De Leuw Cather Canada Limited

D. Dickie
Eaton Yale Ltd.

G. Dipaola-Baranyi
Xerox Research Center of Canada Ltd.

W. B. Foster
Syncrude Canada Limited

R. H. Fox
Westinghouse Canada

T. E. Hogan
Petro Canada

R. C. Hoare
Ontario Ministry of the Environment

H. S. Kerr
Spar Aero Space Limited

A. J. Kingan
Bell Canada

F. J. Mayer
Stelco Inc.

J. J. Mele
Microtel Pacific Research Limited

R. N. Millman
The Ontario Paper Company Limited

A. Nittenberg
Ontario Hydro

F. Ross
NCR Canada Limited

J. Schneider
Dominion Bridge Co. Ltd.

S. Sharzer
The Globe & Mail
Organizations Employing Co-operative Students

The following is a list of employers who participated in Waterloo's co-operative programmes in 1980. The list does not acknowledge the many hundreds of individual departments within the organizations who participated.

Abatic Consulting Services  
Abbey Life Insurance Company of Canada  
Abbott Laboratories Limited  
Abex Corporation  
Abitibi Price Incorporated  
Abram & Nowski  
Acres Consulting Services Limited  
Acres Davy McKees Limited  
The Adams Mine  
Adamson Associates  
Addiction Research Foundation  
Adult Occupational Centre  
Advanced Concrete Services Limited  
AEL Microtel Limited  
AES Data Limited  
Aeta Casualty Company of Canada  
Agnew Associates  
Ainley & Associates Limited  
Air Canada  
Akitt & Swanson  
Albany Canada Limited  
Alberta Energy Company Limited  
Alberta Gas Chemicals Company  
Alberta Oil Sands  
Alberta Power Limited  
Albert College  
Aic Can Canada Products Limited  
Alcan Smelters & Chemicals Limited  
Alchem Incorporated  
Alcore Fabricating Company  
Algoma Ore Division of Algoma Steel Corporation  
Algoma Steel Corporation Limited  
Allan Crawford Associates Limited  
Allatt Limited  
Allen-Bradley Canada Limited  
Lofus A. Allen & Company  
Allent Buildall Limited  
Allsopp Morgan Engineering Limited  
Allward & Gouinlock  
Aluminum Company of Canada Limited  
Amdahl Limited  
Amerence Limited  
American Can Canada Incorporated  
Amersham Corporation  
Amercan Canada Petroleum Company Limited  
Arthur Andersen & Company  
Angelstone Limited  
H. H. Angus & Associates Limited  
API Audio Products International Corporation  
Aquiline Products Limited  
Aquateine Company of Canada Limited  
Arcop Associates  
Elizabeth Arden of Canada Limited  
Armbro Materials & Construction Limited  
Armco Canada Limited  
Arrowhead Metals Limited  
Artex Precast Limited  
Associated Test Equipment Limited  
A.T.F. Engineering Products  
Gordon Atkins  
Atlas Steels Company  
Atomic Energy of Canada Limited  
Ausable-Bayfield Conservation Authority  
The Austin Company Limited  
Automotive Hardware Limited  
Avery Label  
Babcock & Wilcox Canada Limited  
Babcock & Wilcox Refractories Limited  
Bailey & Rose Limited  
E. F. Barnes Limited  
Bakelite Thermosets Limited  
Kenneth W. Ball & Company  
Balmoral Hall  
Bank of Canada  
Bank of Montreal  
Bank of Nova Scotia  
W. A. Barclay Exploration Services Limited  
Barnes Engineering Company Limited  
W. R. Barnes Company Limited  
Barringer Research Limited  
Barton-Aschman Canada Limited  
Bate Chemical Corporation Limited  
The Bay Systems Group  
Bayly Engineering Limited  
Bayridge Secondary School  
BCL Canada Incorporated  
Beak Consultants Limited  
Beardmore & Company Limited  
Beaton & Wills  
Beaver Engineering Limited  
Beaver Lumber Company Limited  
Becker Milk Company Limited  
Beckett Elevator  
Beecham Products Limited  
Beel Controls Limited  
Bell Canada  
Bell City Foundry  
Bell-Northern Research  
Art Benjamin Associates Limited  
Bennett Paving & Materials Limited  
Best Pipe Limited  
Bethesda Home  
Bird Construction Company Limited  
Birkbeck Thoburn & Kertes  
Birkeness Bannister Gray  
Bishop's College School  
Bishop Strachan School  
Bittorf Holland Christiansen  
Black Clawson Kennedy Limited  
Black & Decker Manufacturing Company Limited  
Black & McDonald Limited  
Robert Blair & Associates Limited  
Blake Brady Geological Consultants Limited  
Blankhorn & Sawle Limited  
B & L Metal Products Limited  
Blue Hills Academy  
Blue Hills Farm  
Blue Mountain Resorts Limited  
Riverview Centre for the Developmentally Handicapped  
B-N Software Research Incorporated  
Joseph Bogdan Architect/Urban Design  
Boigon & Armstrong  
Boise Cascade Canada Limited  
Boots Drug Stores (Canada) Limited  
Borden Chemical Company (Canada) Limited  
Borg-Warner (Canada) Limited  
Borough of Etobicoke  
Borough of North York  
Bouey Bouey Rutledge Architects  
Bourrie Wilson Scott & Proctor  
BP Minerals Limited  
BP Oil Limited  
F. G. Bradley Company Limited  
Bradley & Hill  
Brampton Hydro Electric Commission  
Brantford PUC  
Bregman & Hamann  
Breithaupt Centre  
Brewers Association of Canada  
Brewers Warehousing Company Limited  
Bristol-Myers Canada Limited  
Bristol-Myers Pharmacy Group  
British Columbia Systems Corporation  
Brook Carruthers & Shaw  
Brookside School  
Brown Bovet Hiwden Incorporated  
Brownale Incorporated  
Brunton Browning Day & Partners  
Buckley & Kelling  
Building Products of Canada Limited  
Murray G. Bulger & Associates  
R. V. B. Burgoyne  
Burlington Carpet Mills Canada Limited  
Burroughs Business Machines Limited  
Butler Polymers  
Cachia & Decker  
The Cadillac Fairview Corporation Limited  
CAE Electronics Limited  
Calvert of Canada Limited  
Cambrian College of Applied Arts and Technology
Co-ordination and Placement
Organizations Employing Co-operative Students

Cambridge Engineering Group Limited
Canadian Appliance Manufacturing
Canadian Alloys
Canadian Blower/Canada Pumps
Canadian Fine Color Company
Canadian Forest Products
Canadian Gypsum Company Limited
Canadian Fram Limited
Canadian Metal Company Limited
Canadian National Railways
Canadian Oil Sands Limited
Canadian Rubber Company Limited
Canadian Sawmills Limited
Canadian Steel Company Limited
Canadian Timken Limited
Canadian Tire Corporation Limited
Canadian Utilities Limited
Canadian Worchester Controls Limited
Can-Am Instruments Limited
Can-Eng Alloys Limited
Canfarm Co-operative Services Limited
Can-Lake Explorations Limited
Cannon Incorporated
Canstar Communications
Canterbury Foods Limited
Canviro Consultants Limited
Capitol Industries Limited
Carleton Board of Education
Carling O’Keefe Limited
Carma Industries Limited
Carnation Company Limited
Carr & Donald Associates Limited
Ira Carr Construction Limited
Cawthra Park Secondary School
CBS Records Canada Limited
C. C. L. Industries Incorporated
C.C.M.
C & C Yachts
C/E Bauer Combustion Engineering Incorporated
Central Dynamics Limited
Centralla College of Agricultural Technology
Central Lake Ontario Conservation Authority
Central Mortgage & Housing Corporation
Central Ontario Television Limited
Champion Road Machinery Limited
Chandler Kennedy Architectural Group
Chandler Kennedy Partnership
Chateau-Gai Wines Limited
Chedoke-McMaster Hospital
Chemetrics International Limited
Chemex Labs (Alberta) Limited
Cheney Glenn & Graydon
Chevron Standard Limited
Childrens Rehabilitation Centre of Essex County
Chipman Incorporated
Chippewa Secondary School
Christie Brown & Company Limited
Chrysler Canada Limited
Chrysler Shillington Denomy Peterson & Bruner
C. I. L. Incorporated
Cimco Limited
Citadel General Assurance
City of Beaconsfield
City of Brampton
City of Brantford
City of Burlington
City of Cambridge
City of Chatham
City of Edmonton
City of Kanata
City of Kitchener
City of London
City of Mississauga
City of Niagara Falls
City of Ottawa
City of Owen Sound
City of Peterborough
City of Saint John
City of Sarnia
City of Sault Ste. Marie
City of St. Catharines
City of Thunder Bay
City of Toronto
City of Waterloo
City of Windsor
CKNX
Adam Clark Co. Limited
Clarke Darling Downey Architects
Clarke Henning & Company
Clarke Starke & Diegel
Clarkeston Gordon & Company
T. Clay Manufacturing Limited
Cleveland’s House
Clifford Lawrie Bolton Ritchie
CNCP Telecommunications
Cohoe Evamy & Partners
Cole Rubin Finkelstein & Green
Colgate-Palmolive Canada
Com Dev. Limited
Cominco Limited
Commercial Enclosed Fuse Co.
Commercial Union Assurance Group
Commonwealth Holiday Inns of Canada
Computer Systems Limited
Computer Methods Canada Limited
Computing Devices Company
Comshare Limited
Consumers Glass Co. Limited
Conestoga College of Applied Arts & Technology
Conestoga-Rovers & Associates
Confederation College of Applied Arts & Technology
Confederation Life Insurance Company
Conf-Force Products Limited
Consolidated Bathurst Limited
Consumers Gas Company
Consumers Glass Company Limited
Continental Group of Canada Limited
Control Data Canada Limited
V. B. Cook Company Limited
Co-op Atlantic
The Co-operators
Coopers & Lybrand
Cooper Tool Group Limited
Coronet Carpets Limited
Corporate Consultants
Corrosion Service Company Limited
John V. Cortens Chartered Accountant
Coulter Copper & Brass Limited
County of Brant
County of Hastings
County of Lincoln
County of Northumberland
County of Perth
County of Waterloo Separate School Board
Co-ordination and Placement
Organizations Employing
Co-operative Students

COURTAULDS (CANADA) INCORPORATED
E & B COWAN
COX HYATT & COMPANY
CPP RECREATION SERVICES
VICTOR G. CRAGG
CRAIG KOHLER & DICKY
CRANE PACKING COMPANY LIMITED
CRAIN & BOAKE
CRAWFORD MORTON JANES JACKLIN
CREATIVE CENTRE FOR LEARNING
CRAIG PACKING COMPANY LIMITED
CREMAMCO SYSTEMS LIMITED
CROUSE-HINDS CANADA LIMITED
CROWN LIFE INSURANCE COMPANY
CTV TELEVISION NETWORK LIMITED
G. G. CUNNINGHAM & ASSOCIATES
CHARITABLE ACCOUNTANTS
CURTIS ENGINEERING & TESTING LIMITED
CYANAMID CANADA LIMITED
DAT I. INDAI LIMITED
D'ANGELA SORRENTO CANALE & PALOMBO
CHARITABLE ACCOUNTANTS
DARY PLACE
DART C. P. SERVICES LIMITED
DASCOM LIMITED
DATACROWN INCORPORATED
DATALINE SYSTEMS LIMITED
DATAMEX LIMITED
DATA RESOURCES OF CANADA
DAVIS ERYOU & ASSOCIATES LIMITED
DAYMOND LIMITED
PHILIP M. DECARLO CHARITABLE ACCOUNTANT
JOHN DEERE LIMITED
DEFIANCE SYSTEMS CANADA LIMITED
DELOITTE HASKINS & SELLS
DELORO STEEL LIMITED
DELTA-BENCO-CASCADE LIMITED
DELTA ENTERPRISES (SARNIA) LIMITED
DENISON MINES LIMITED
DIALECTIC COMPUTER SERVICES
A. J. DIAMOND ASSOCIATES
DIAMOND SHAMROCK CANADA LIMITED
DICK HUBBARD FITNESS CENTRE LIMITED
DIESEL EQUIPMENT LIMITED
DIGITAL EQUIPMENT OF CANADA LIMITED
DIGITAL METHODS LIMITED
DIGITAL VIDEO SYSTEMS LIMITED
M. M. DILLON LIMITED
DIVERSIFIED RESEARCH LABORATORIES
DIXON APPLICATORS LIMITED
DIXON GORDON & COMPANY
D. L. CUSTOM LIMITED
DMR & ASSOCIATES
D. M. W. COMPANY LIMITED
H. R. DOANE & COMPANY
NORMAN DObELL & ASSOCIATES
DOFASCO INC.
DOMINO EXPLORATION CANADA LIMITED
DOMINION MINES LIMITED
DOMINION PETROLEUM LIMITED
DOMINGAS INCORPORATED
DOMINION BRIDGE COMPANY LIMITED
DOMINION ENGINEERING WORKS LIMITED
DOMINION LIFE ASSURANCE COMPANY
DOMINION STORES LIMITED
DOMITAR LIMITED
DORCAN LIMITED
DOVER CORPORATION CANADA LIMITED
DOW CHEMICAL OF CANADA LIMITED
PHILIP DOYLE LIMITED
DRAVO MANUFACTURING LIMITED
D. R. G. LIMITED
DSMA ATCON LIMITED
DUFFERIN CONSTRUCTION COMPANY
DUFFERIN PEEL SEPARATE SCHOOL BOARD
DUNLOP FARROW ATKEN
DUNWOODY & COMPANY
DUPONT CANADA INCORPORATED
DURHAM BOARD OF EDUCATION
DURHAM COLLEGE OF APPLIED ARTS & TECHNOLOGY
DURST VODDEN & BENDER
DYER/BROWN & ASSOCIATES
DYNALOGIC CORPORATION
DY-4 SYSTEMS INCORPORATED
EATON/BAY FINANCIAL SERVICES
EATON YALE LIMITED
EBSATEC LAVALIN INCORPORATED
E. B. EDDY FOREST PRODUCTS LIMITED
E. C. E. GROUP
EUROINFORMATIQUE LIMITED
ECOLEAIRE LIMITED
T. J. ECESDI & ASSOCIATES LIMITED
EDDY FOREST PRODUCTS LIMITED
ELDORADO NUCLEAR LIMITED
ELECTROHOME ELECTRONICS
ELGIN HOUSE
ELGIN MIDDLESEX DETENTION CENTRE
ELIOTT & ASSOCIATES
ELIOTT & BOBOT
EIMHRURST'S FOUR SEASON RESORT
E. M. A. INDUSTRIES
EMERY INDUSTRIES LIMITED
EMPICO FAB LIMITED
EMPIRE LIFE INSURANCE COMPANY
ENERGY PRODUCT GROUP
ENERVAC CORPORATION
ENTWISTLE ADAMS & HUTCHESON
ENVICRON LIMITED
EPITEX ELECTRONICS LIMITED
EQUITY DEVELOPMENT GROUP LIMITED
ERCO INDUSTRIES LIMITED
ERINDALE SECONDARY SCHOOL
FRIST & WHINNEY
ESB CANADA LIMITED
STEVEN M. ESKIND ARCHITECT
ESSO CHEMICAL CANADA
ESSO RESOURCES INCORPORATED
T. S. TOWERS INCORPORATED
EVANS & MARTIN RYFCROFT CLARK
EXCELSIOR LIFE INSURANCE COMPANY
EXCO ENGINEERING
EXOLON COMPANY OF CANADA LIMITED
FACEILLE COMPANY LIMITED
FALCONBRIDGE NICKEL MINES LIMITED
FALK CORPORATION OF CANADA LIMITED
FAMILY SERVICE ASSOCIATION
FARINON ELECTRIC OF CANADA LIMITED
FAULTLESS DOERER COMPANY LIMITED
FEDERAL PIONEER LIMITED
FENCO CONSULTANTS LIMITED
FERMAR PAVING LIMITED
FERANTI-PACKARD ELECTRONICS LIMITED
FERRCO ENGINEERING LIMITED
FERRO INDUSTRIAL PRODUCTS LIMITED
FIBERGLAS CANADA LIMITED
FIELDING CROSSMAN & ASSOCIATES LIMITED
FINANCIAL MODELS COMPANY
FIREMAN'S FUND INSURANCE COMPANY OF CANADA
FIRESTONE CANADA INCORPORATED
FISCHBACH & MOORE OF CANADA LIMITED
FISHER & PORTER (CANADA) LIMITED
FISCHER CONTROLS COMPANY OF CANADA LIMITED
DAVID FISHER RESIDENCE
FISHERIES & OCEANS LIGHT LAMPS
CONTROL CENTRE
HENRY FLIES
THE FOOTWEAR & LEATHER RESEARCH INSTITUTE OF CANADA
FORD KEAST GILES SMITH & PHILLIPS CHARITABLE ACCOUNTANTS
FORD MOTOR COMPANY OF CANADA LIMITED
FOREST HEIGHTS POOL
FREIGHTALCO CANADA CORPORATION
FORT WHEELER LIMITED
FOX GLICKSMAN & COMPANY
FRAM CANADA LIMITED
FRANKEL STEEL LIMITED
FRANKLIN MANUFACTURING COMPANY (CANADA) LIMITED
FRASER INCORPORATED
FREDERICK PARKER (CANADA) LIMITED
GAGNE & GAGNON
GALTACO INCORPORATED
GAMSBY & MANNEROW LIMITED
GANDALF DATA COMMUNICATIONS LIMITED
GARDNER McDoNALD & COMPANY
GARRETT MANUFACTURING LIMITED
GAUILLER & COMPANY
GEAC CANADA LIMITED
GELLMAN HAYWARD & PARTNERS LIMITED
GENERAL FOODS LIMITED
GENERAL & MARINE HOSPITAL
GENERAL MILLS LIMITED
GENERAL MOTORS OF CANADA LIMITED
GENERAL REFRIGERATION CANADA LIMITED
GENERAL SIGNAL LIMITED
GENERAL WIRE & CABLE COMPANY LIMITED
GENESOS CANADA LIMITED
GENSTAR DEVELOPMENT COMPANY
GEOLOGICAL SURVEY OF CANADA
GEOSEARCH CONSULTANTS LIMITED
GEOTERREX LIMITED
GETTY MINES LIMITED
GIBBS NATHANIEL (CANADA) LIMITED
STEPHEN R. GIBSON
Co-ordination and Placement
Organizations Employing Co-operative Students

| Hercules Canada Limited                | International Import Customs Brokers Limited |
| Heritage Nursing Homes                 | International Systems Limited               |
| Hewitt Associates                     | Interssteel Consultants Limited            |
| Hewlett-Packard (Canada) Limited      | Intertech Remote Sensing Limited            |
| H. H. Bush & Associates Limited       | Inuit Tapirisat of Canada                  |
| High Standard Mud Services Limited    | Investors Syndicate Limited                |
| Hilborn Ellis Grant & Company         | Iron Ore Company of Canada                 |
| Donald Hill & Partners                | Irving Oil Limited                         |
| C. M. Hincks Treatment Centre        | Irving Pulp & Paper Limited               |
| Hinman & Company                      | Istec Limited                              |
| Home Oil Company Limited              | ITT Canada Limited                         |
| Homeware Industries Limited           | ITT Grinnell                               |
| Homewood Sanitarium                   | J. H. Jarrett                              |
| Honeywell Limited                     | Rolf Jensen & Associates Limited           |
| Honeywell Information Systems         | Anton Jensen & Company                     |
| Horseshoe Valley Resort               | Johnson Controls Limited                   |
| Horton Ball Walter Fedy McCargar     | Johnson Cross Yanoisk                      |
| Hachborn                              | Johnson & Johnson                          |
| Horton CBI Limited                    | Johnson & Matney Limited                   |
| Hudson Bay Mining & Smelting Company  | Johnston Soper Limited                     |
| Hudson Engineering                    | J. H. Jorden                               |
| Hudson's Bay Oil & Gas Limited        | Joy Manufacturing Company (Canada) Limited |
| Hunterview School                     | Jung/Branhner Associates Incorporated      |
| Hunter Enterprises Orilla Limited     | Kaiser Resources Limited                   |
| Husky Oil Limited                     | Kappele Wright & MacLeod Limited           |
| Hyde Houghton & Company               | Kaptast Engineering Limited                |
| Hydro Electric Commission            | William C. Karleff                         |
| Cambridge & North Dumfries           | Stephen Katz Associates                    |
| Hymac Limited                         | Architect & Planner                        |
| IBI Group                             | Kayrea Consultants Limited                 |
| IBM Canada Limited                    | Kearney-National (Canada) Limited          |
| ICL Computers Canada Limited          | Keenan & Bell                              |
| Image Video Limited                   | Keeprite Products Limited                  |
| Imperial Oil Limited                  | Kellogg Salted Canada Limited              |
| Imperial Oil Enterprises Limited      | Kelly McKay Lewis Stefaniizzi              |
| Imperial Optical Company Limited      | Kelvin Energy Limited                      |
| Imperial Tobacco Limited              | Komper Insurance                           |
| Inco Metals Company                   | Kendall Canada                            |
| Indal Data Centre                     | Kenner Collegiate & Vocational Institute   |
| Independent Order of Foresters       | Key Publishers                            |
| Industrial Lawn Mowing Service       | Peter Kiewit Sons Company Limited          |
| Industrial Life Technical Services    | Kilborn Engineering Limited               |
| Incorporated                          | Kilmer Van Nostrand Company Limited        |
| Informetica Limited                   | Kimberly-Clark of Canada Limited           |
| Ingersoll PUC                         | Kindred Industries Limited                 |
| Ingersoll-Rand Canada Incorporated    | Kingston Psychiatric Hospital              |
| Inglis Limited                        | R. Kirby & Associates                     |
| Inner City Angels                     | Kitchener Public Library                   |
| Inskip & Wilczynski Architects        | Kitchener-Waterloo Hospital                 |
| Institute of Man & Resources         | Klockner-Moeller Limited                   |
| Insurance Bureau of Canada           | Knud Simonsen Industries Limited           |
| Insurers Advisory Organization of     | Kodak Canada Incorporated                  |
| Canada                                | Korlin Limited                             |
| Intercontinental Pulp Company Limited| K-TEK Electro-Services Limited             |
| International Harvester Company of    | John Labatt Limited                        |
| Canada Limited                        | Labatt's Ontario Breweries Limited         |
| John T. Hepburn Limited               | Lackie Brothers Limited                    |
| Lady Fitness                          | Lakefield College School                   |

Giffels Associates Limited
Gilvesy Construction Limited
Ginberg Gluzman Fago & Lavitz
Glaxo Canada Limited
Global Communications Limited
Global Travel Computer Services
Globe & Mail
Glos Associates Limited
Goebelle Wagner Macadam
H. Q. Golder & Associates
Goldfields Exploration Canada Limited
B. F. Goodrich Canada Limited
Gordon Graydon Memorial Secondary School
Gore Mutual Insurance Company
GO Transit
Government of Alberta
Government of Canada
Government of Manitoba
Government of Northwest Territories
Government of Ontario
Government Members' Service Bureau
Graham Setterington
Grand River Cable TV Limited
Grand River Conservation Authority
Grand & Toy Limited
Grandview Lodge
Greater Niagara General Hospital
Great Lakes Biolumnology Lab
Great Lakes Forest Products Limited
Great Lakes Power Company Limited
Great West Life Assurance Company
Grebe Industries Limited
A. P. Green Refractories (Canada) Limited
Howard M. Greenspan Architect
Greenwood Meltz Silverstein & Herlick
Greer Fleming & Rolland
Grey-Bruce District Health Council
Griffith Laboratories Limited
Guaranty Trust Company of Canada
Guelph Engineering Company Limited
Guelph Hydro
Guideline Instruments Limited
Gulf Canada Limited
Gulf Canada Products Company
Gulf Canada Resources Incorporated
Gulf Minerals Canada Limited
Hamilton Board of Education
Hamilton Psychiatric Hospital
Hamilton Region Conservation Authority
Hammond Manufacturing Company Limited
Harris Media Services Limited
Thomas Harris Engineering Limited
Harris Title & Wasserman
Hart Chemical Limited
Havergal College
Hawthorn Mansfield Towers
Heaton & Hassal
Heat Pumps Canada Limited
H. J. Heinz Company of Canada Limited
John T. Hepburn Limited
Lakefield District Secondary School
Lakehead Region Conservation Authority
Lakehead University
Lake Ontario Cement Limited
Lake Ontario Steel Company Limited
F. Joseph Lamb Company
Gail E. Lamb
Langhorne & Lynch
Langlois Hauck & Company
Latendorf Conveying Limited
Laura Secord Candy Shops Limited
Laurentian Hospital
Laurier Life Insurance
J. D. Lee Engineering Limited
Lee Merrick & Associates Limited
Leigh Instruments Limited
Ernest Leitz (Canada) Limited
Allan Levine Architect
Levitsky Feldman Wexler & Partners
Libbey St. Clair Incorporated
Dan Li
Linar Machine Limited
Linear Technology Incorporated
Lithwick Johnston & Moy
Liton Systems (Canada) Limited
Loblaws Limited
M. Loeb Limited
London Life Insurance Company
London PUC
W. P. London & Associates Limited
Longford Equipment International Limited
Long Manufacturing
R. F. Lonsdale & Associates Limited
Looby Construction Limited
Lorlea Steels Limited
Lubrizol of Canada Limited
Lummus Company Canada Limited
Lutheran Life Insurance Society of Canada
Lutter Management Consultants
Lyndhurst Hospital
MacBeth Williams Woodruff & Haddaway
MacDonald Dettwiler & Associates
John A. MacDonald
MacDonald & Zuberec
MacGillivray & Company
MacDonald Dettwiler & Associates
Mongan Chandler Kennedy
Architectural Group
Meteorological & Environmental Planning Limited
Metrex Instruments Limited
Metropolitan Life Insurance Company
Micom Company
Midland Ross (Canada) Limited
Midwestern Regional Centre
Mills Laboratories Limited
C. Blakeway Millar
Millard Roupe & Rosebrugh
Miracle Food Mart
Mississauga Racquets Club
Mississauga Transit
Mitel Corporation
Mobil Chemical Canada Limited
Mobil Oil Canada Limited
Moffat Moffat & Kinoshita
Mohawk College of Applied Arts & Technology
Molson Companies Limited
Molson's Brewery (Ontario) Limited
Monsanto Canada Incorporated
Monteith Monteith Company
Montreal Engineering Company Limited
Mony Life of Canada Limited
Moose Instrument Company Limited
Morrison & Beatty Limited
Motorola Canada Limited
M N C Alarms
MTD Products Limited
Multiple Access Computer Group
Multiple Sclerosis Society of Canada
Municipality of Metro Toronto
Murphy Oil Company Limited
Murray & Murray Griffths & Rankin
Muskoka Centre
Mutual Life Assurance Company of Canada
Mutual of Omaha Insurance Company
Naam Products Limited
Nashua Canada Limited
National Arts Centre
National Cancer Institute of Canada
National Film Board
National Grocers Company Limited
National Life Assurance Company of Canada
National Research Council
National Sales Incentives Limited
National Trust Company Limited
Navtel Limited
NCR Canada Limited
Nela Incorporated
Nestle (Canada) Limited
Niagara College of Applied Arts & Technology
Niagara Paint & Chemical Company
A. C. Nielsen Company of Canada Limited
Nightingale & Guigui
C. W. Noble Architect
Noranda Mines Limited
Noranda Research Centre
Noranda Sales Corporation Limited
Norcen Energy Resources Limited
Norpak Limited
Norrit Architects
Nortak Software Limited
North American Life Assurance Company
Northern & Central Gas Corporation Limited
Northern College of Applied Arts & Technology
Northern Secondary School
Northern Telecom
Nutriland Engineering Limited
Northwestern Regional Centre
North York Board of Education
North York Hydro
Norwich Union Life Insurance
Nova, An Alberta Corporation
Novatronics of Canada Limited
Nutrix Limited
Nuodex Canada Limited
Observation & Detention Centre
Occidental Life Insurance
Ocean Falls Corporation
Office of the Legislative Assembly
Office of the Ombudsman
Michael Ch Ogus Architect
O&K Orenstein & Koppel Canada Limited
Ontario Cancer Institute
Co-ordination and Placement
Organizations Employing Co-operative Students

Ontario Cancer Treatment & Research Foundation
Ontario Centre for Remote Sensing
Ontario Centre for the Deaf
Ontario Crippled Children's Centre
Ontario Educational Communications Authority
Ontario Electrical Construction
Ontario Energy Corporation
Ontario Geological Survey
Ontario Hydro
Ontario Land Corporation
Ontario Paper Company Limited
Ontario Research Foundation
Onward Manufacturing Company Limited
Optikon Corporation Limited
Orangeville District Secondary School
George A. Ormsby
Ortho Pharmaceutical (Canada) Limited
Oshawa Group Limited
Otico Foundry
Oris Elevator Company Limited
Otis Elevator Company Limited
Ortho Pharmaceutical (Canada)
George A. Ormsby
Pigott Construction Company Limited
Pigott Construction Company Limited
Pioneer Chain Saw Corporation
Pioneer Chain Saw Corporation
Pioneer Chain Saw Corporation
Power Tel Utilities
Pitney Bowes Limited
Pitney Bowes Limited
Pitney Bowes Limited
Plante Moran Limited
Plywood Limited
Polycom Systems Limited
Polygram Incorporated
Pouyat Limited
Poyar Limited
Pow Wow Point Lodge Company Limited
Pow Wow Point Lodge Company Limited
P. P. G. Industries Canada Limited
P. P. G. Industries Canada Limited
Pratt & Whitney Aircraft of Canada Limited
Pratt & Whitney Aircraft of Canada Limited
Prentice-Hall of Canada Limited
Premier Sand & Gravel Company Limited
Price Newfoundland Pulp & Paper
Price Waterhouse & Company
Prince Edward Centre
Prince George Pulp & Paper Limited
Prior Data Sciences Limited
Procor Limited
Proctor's & Gamble Incorporated
Proctor & Gamble Cellulose Limited
Proctor & Gamble Specialties Limited
Proctor & Redfern Limited
Pro-Eco Limited
Project Dare
Provincial Crane
Proviest Industrial Tankers Limited
Pruvace Data Services
Prudential Assurance Company Limited
Prudential Assurance Company Limited
Prudential Insurance Company of America
Puertico Canada
Pulp & Paper Research Institute of Canada
Purolator Limited
Pye & Richards
Quaker Oats Company of Canada Limited
Quaker Oats Company of Canada Limited
Quasar Systems Limited
Queen Elizabeth Hospital
Queen Street Mental Health Centre
Queen's University
Rappo Data Systems Limited
Rapco Foam
Hapistan Systems Limited
Ray Ariss Green & Nowak
Raytheon Canada Limited
Regional Municipality of Durham
Regional Municipality of Hamilton-Wentworth
Regional Municipality of Niagara
Regional Municipality of Ottawa-Carleton
Regional Municipality of Peel
Regional Municipality of Sudbury
Reichhold Limited
F. J. Reinders & Associates Limited
Repac Construction & Materials Limited
Restigouche & Bay Chaleur Soldiers Memorial Hospital
J. L. Richards & Associates Limited
Rio Algom Limited
Riu Tinto Canadian Exploration Limited
Wm. Roberts Electrical & Mechanical Limited
Robinson Lott & Broham
Rogers & Associates
Rohm & Haas Canada Limited
Rolland Construction Company Limited
Rondar Services (Canada) Limited
Ronville Lodge
Ronson/Stienstra Haverty & Rankin Architects
Rosenberg & Company
Rosenberg Fine Goodfield
Ross Laboratories
Ross Pope & Company
P. S. Ross & Partners
Royal Bank of Canada
Royal Canadian Mounted Police
Royal Insurance Canada
Royal Military College of Canada
Royal Ottawa Hospital
Royal Trust
Rubbermaid (Canada) Limited
Ruddy Electric Wholesale Company Limited
Murray Rumack Stern & Cohen
Ryback Smith & Ginsler Limited
Ryerson Polytechnical Institute
Rygel Home
Sacred Heart Children's Village
Saddington Greenfield & Company
Saftron Systems Limited
Samson Belair & Partners
Sangamo Canada
Sankey Werleman Guy Architects
Sarco Canada Limited
Sault Ste. Marie Gymnastics Club
Scarbrough Board of Education
Scarbrough General Hospital
Schlumberger of Canada
Schleiegi Company Canada Limited
Schlumberger of Canada
J. M. Schneider Incorporated
Scholar's Choice Limited
H. S. Scott & Associates
Scouts Canada Oshawa Council
SDI Associates Limited
Joseph E. Seagram & Sons Limited
Sears Limited
Secker Ross
Seeburn Metal Products Limited
Selby Madgett Boler & Haar
Shaban Manufacturing Limited
I. P. Sharp Associates Limited
Shaw Industries Limited
Shaw Industries Limited
Shearing Engineering Company Limited
Shaw Industries Limited
Shaw Pipe Industries Limited
Sheildons Engineering Limited
Shell Canada Limited
Shell Canada Resources Limited
Shelter-Globe of Canada Limited
Sheppard Cartridge Hammond & Company
Sheppard Club
Sheridan College of Applied Arts & Technology
Sheridan Nurseries Limited
Sherman Mines
Co-ordination and Placement
Organizations Employing Co-operative Students

Sherritt Gordon Mines Limited
Shopsty’s Foods Limited
Shore Tile Henschel Irwin Peters
J. E. Sievenpiper
Autometrics
Silknit Limited
Sitronics Limited
Simcoe Hall Crippled Children’s Centre
Simon Fraser University
A. G. Simpson Company Limited
Simpsons-Sears Limited
Sinclair & Valentine Company of Canada Limited
J. J. Singer Consulting Economists Limited
Sir James Whitney School
Smith & Nephew & Company
Snap On Tools of Canada Limited
Solaray
Joseph C. Somfay
A. H. Soufrine & Company
Southwestern Regional Centre
Spar Aerospace Limited
Sparton Corporation of Canada Limited
Sparton of Canada Limited
Sparton Limitée
Specialty Chemicals Limited
Speedy Muffler King
Sperry-Univac
Springer Chapman & Company
Sprucedale School
Spruce Falls Power & Paper Company Limited
Sprung Instant Structures
Square D Company of Canada Limited
Stafford & Haensli
Stahl & Nicolaidis
Standard Brands Canada Limited
Standard Pressure Pipe Company
Stanstead College
Start Centre
St. Clair College of Applied Arts & Technology
St. Clair Region Conservation Authority
Stelco Inc.
Stelco Employees Credit Union
Stephens-Adamson
Sterling Drug Limited
Sterling Varnish Company (Canada) Limited
Stevenson Raines Barrett Christie
Hutton Seton & Partners
Stewart Seeds Limited
Steward Warner Corporation of Canada Limited
Robert Stiff Architect
Stille & Sutton
St. John’s School
St. Joseph’s Exploration
St. Joseph’s Hospital
St. Lawrence Cement Company
St. Lawrence College of Applied Arts & Technology
St. Lawrence Regional Centre
St. Lawrence Seaway Authority
St. Marys Cement Limited
Stone Conway Anger Snowbell & Company
Stonehenge Systems Incorporated
Stratford P U C
Sudbury Board of Education
Sudbury Hydro
Sudbury Memorial Hospital
Sullivan Strong Scott Incorporated
Sunar Industries Limited
Sunbeam Home
Suncor Incorporated
Sun Life Assurance Company
Sunnybrook Medical Centre
Sunrise Home for the Aged
Sunoco Incorporated
Sunset Home for the Aged
Swain & Runpnow
Switzer Engineering Services Limited
Sybron Canada Limited
Syn crude Canada Limited
Systemhouse Limited
Tailisman Resort Hotel
Tax Time Services
Taylor Engineering
Taylor Steel Incorporated
Tectrol Incorporated
Tekloig Limited
Teleglobe Canada
Tele-Radio Systems Limited
Teleride Corporation Limited-
Telesat Canada
Temprire Industries Limited
Terra Mining & Exploration
Terraprobe Limited
Texasco Canada Incorporated
Texasqulf Incorporated
Thames Valley District Health Council
Thomas A. Stewart Secondary School
J. E. Thomas Specialties Limited
Thorne Riddell B Company
Touche Ross & Company
Towers Perrin Forster & Crosby
Townend Stetura Baleshta
Town of Caledon
Town of Elliot Lake
Town of Grimsby
Town of Kincardine
Town of Kirkland Lake
Town of Lindsay
Town of Markham
Town of Richmond Hill
Town of Vaughan
Town of Whitby
Township of Sarnia
Tracor Engineering Limited
Trail Manufacturing Limited
Transcanada Pipelines
Trans Union Fasteners
Travelers of Canada
Trecan Limited
Trench Electric Limited
Truswal Systems Canada Limited
TRW Canada Limited
TRW Data Systems
B. J. Turner Incorporated
Peter Turner
Tusco Trailer & Utility Supply Limited
Umex Corporation Limited
Underwood McLeilian Limited
Union Carbide Canada Limited
Union Drawn Steel Company Limited
Union Gas Limited
Union Mierei Exploreations & Mining Corporation Limited
Union Oil Company of Canada Limited
Uniroyal Limited
United Carr
United Co-operatives of Ontario
United Tire & Rubber Company Limited
Universal Industries Limited
University Hospital (London)
University of Alaska
University of Guelph
University of Notre Dame
University of Toronto
University of Waterloo
University of Western Ontario
University of Windsor
Upjohn Company of Canada
Upper Canada College
Upper Thames River Conservation Authority
Urangergesellschaft Canada Limited
Utah Mines Limited
Valcom Limited
Valleyview Home for the Aged
Varian Canada Limited
T. M. Vari & Associates Limited
C. A. Ventin
Versatile Manufacturing Limited
Vic Tanny’s Health Spa
Victaulic Company of Canada Limited
Victoria & Grey Trust
Volker Craig Limited
Wabo Limited
Wabo Equipment of Canada
Wabush Mines
Walbar Machine Products of Canada Limited
Walbrook Appointments
B. P. Walker Associates Limited
Walker Brothers Quarries
Walker Exhausnts
Hiram Walker & Sons Limited
Hiram Walker-Consumers Home Limited
Walker Fedy McCargar Hachborn
Wampole Limited
Ward Mallette
Warner-Lambert Canada Limited
Mykola Wasytko
The University Libraries

Engineering, Mathematics & Science (EMS) Library
The University Libraries

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

Assistant to the Librarian - Administration
L. Beattie, BA (Loyola of Montreal), MA, PhD (Waterloo)

Administrative Assistant to the University Librarian
N. Allee, BA (McMaster)

Business Administrator
J. Jorgensen, BA (Toronto)

Assistant Librarian for Systems
G. Damon, BA (Maine), MLS (Case Western)

Special Collections Librarian
S. Bellingham, BA (Wat. Luth.), MLS (W. Ont.)

Support Services

Associate Librarian for Support Services
C. D. Emery, BA (Durham), ALA

Acquisitions Department Head
E. Waterman, BA (McMaster), BLS (Toronto)

Cataloguing Department Head
W. Oldfield, BA (Wat. Luth.), MLS (W. Ont.)

Cataloguers
H. Calogeridis, BA, MLS (McGill).
A. Chan, BA (Hong Kong), MLS (W. Ont.)
Y. Gordon, BA (Manitoba), BLS (Toronto)
R. Lamb, BA (Guelph), MLS (W. Ont.)
M. Wan, BSc (Hong Kong), MA, MLS (W. Ont.)
L. Helfand, BSc (York), MLS (W. Ont.)

Serials Department Head
B. Bruder, BA (Wat. Luth.)

Cataloguer
J. Kuhn, BA (Creighton), MLS (W. Ont.)

Reader Services

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

Dana Porter Arts Divisional Library

Circulation Department Head
E. Reaman, ATCM, BA (McMaster), BLS (Toronto)

Reference & Collections Development Department Head
T. Eadie, BA, MA (Queen's), MLS (W. Ont.)

Reference & Collections Development Librarians
J. Addico, BA (Phillips), MA (Northwestern), MLS (W. Ont.)
M. Aquan-Yuen, BA, MLS (Toronto)
J. Beglo, BA (Wat. Luth.), MLS (Toronto)
M. Blok, BA (Waterloo), MLS (W. Ont.)
R. Crusz, BA (Ceylon), BLS (Toronto), MA (Waterloo)
D. Fitzpatrick, BA, MA (Windsor), MLS (Toronto)
A. Lakos, BA (Jerusalem), MLS (Br. Col.)
S. MacKinnon, BA (Mount Allison) BLS (McGill)
G. Man, BSc (Wisconsin-Oshkosh), MLS (Toronto)

Government Publications Department Head
L. Claxton, BA (Waterloo), BLS, MLS (Toronto)

Librarians
S. Sunday, BA (Carleton), MLS (W. Ont.)
S. Moskal, BSc, MA (Wisconsin-Madison), MLS (W. Ont.)

Orientation Librarian
G. Meek, BA (McMaster), MA, MLS (W. Ont.)

Engineering, Mathematics and Science Divisional Library

Assistant Librarian for the Engineering, Mathematics and Science Divisional Library
C. Presser, AB (Hunter), MLS (Pratt)

Co-ordinator of Machine-Assisted Reference Service
I. Rodin, BSc (McGill), MLS (W. Ont.)

Reference & Collections Development Department Head
F. Abrams, BA (Sir G. Wms.), MLS (McGill)

Reference & Collections Development Librarians
N. Bastedo, BA (Rollins), MS (Toronto), MLS (W. Ont.)
W. Macpherson, BSc, MLS (Dalhousie)
D. Morton, BSc, MLS (W. Ont.)
J. Parrott, BSc (Queen's), MSC, BLS (Toronto)
B. Toth, BA (Queen's), MLS (McGill)

University Map Library Librarian
R. Pinnell, BSc, MSC (Toronto), MLS (W. Ont.)
The University Libraries

The Library is central to the academic programmes of the University. Its function is to provide books, journals and other library materials to support these programmes. 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 Arts Library, and the Engineering, Mathematics and Science Library; one branch library, the University Map Library; and two reading rooms, the Architecture Reading Room and the Optometry Reading Room.

The Dana Porter Arts Library, situated in the centre of the campus and rising to a height of ten stories, is the focal point of the University. The lower floors house the main reader services and support services departments. Reader services located on the first floor include a large Reserve Reading Room with seating for 160 readers, a Rare Book Room, a Listening Room with facilities for both phonodiscs and audio cassettes 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 and microforms are located on the third floor. Government publications are located on the fifth floor. The upper floors (six through ten) house the circulating book collection and contain seating accommodation for more than 700 library users.

The Arts Library collection numbers over 1,600,000 items including books, pamphlets, theses, microforms, documents, reports, sound recordings and other material. The Library subscribes to over 5,400 periodicals and 61 newspapers, both important elements of the collection.

The Engineering, Mathematics and Science Library occupies the fourth floor of the Mathematics and Computer Science Building. The three principal reader services - the catalogue, the circulation counter and the Information Desk are visible from the entrance to the Library. Seating is provided for 570 readers.

The E.M.S. Library collection numbers over 245,000 items including books, microforms, government publications, technical reports and maps. The Library subscribes to over 4,000 current serials.

The University Map Library is housed on the main floor of the Environmental Studies Building. It is the principal University centre for the provision of service relating to cartographic material. The collection consists of 50,000 maps, 1,000 atlases and 15,000, aerial photographs. Like the Arts and EMS libraries, its resources are available to all members of the University.

The Architecture and Optometry Buildings house the two official Reading Rooms. They contain the bulk of the Library's collection in their respective fields.

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 11,000 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 28,000 volumes. St. Paul's College Library has about 3,000 books specializing in the area of Religious Studies. The 3,000 volumes in the Renison Library serve the College's Social Development Studies Programme and its courses in Third World Studies and General Arts. A small section deals with Anglican theology.

The University of Waterloo, Wilfrid Laurier University, and the University of Guelph Libraries have co-operative borrowing agreements which allow students, faculty and staff of one institution to borrow monographs from the other Libraries. WLU'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.

The staff of the University Library is engaged in obtaining material, in processing it for the collections, and in providing access to the collections. During the day and evening, reference and circulation staff are on duty to assist in the use of collections, facilities and services. The library building remains open after reference and circulation services close.

The Library Handbook, revised annually, is available in all the libraries. It explains the use of the libraries, the classification system, the card catalogues, the serial list and general rules and procedures. Also available are other publications, such as bibliographies, lists of reference materials 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.
Faculty of Arts

Prof. M. Cherniavsky, History
The Faculty of Arts

The main objective of the Faculty of Arts is to provide the student with a liberal arts education. A liberal arts education 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 programmes described under Arts Programmes.

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 Grade 13 and for those not currently registered in Ontario Grade 13. See Chapter 2 for details. Admission requirements for part-time students are the same as for full-time students.

Applicants who wish to study full-time must submit their application through the Ontario Universities' Application Centre (OUAC).

Applicants for part-time, non-degree, or correspondence courses may obtain application forms from the Registrar's Office (Needles Hall) at the University of Waterloo.

2) Transfer Credit

Generally transfer credit is given for pertinent courses in which a grade of 60% or better was obtained. Students transferring from other institutions 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 student's University of Waterloo average.

Students transferring 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 80% (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 Programmes

GENERAL PROGRAMMES

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 programme. A three-year General BA is offered in the following disciplines:

Anthropology  Latin  Medieval Studies
Classical Civilization  Music  Philosophy
Drama and Theatre Arts  Political Science
Economics  Psychology  Religious Studies
English  Russian  Social Development
Fine Arts  Studies  Sociology
French  Spanish  Greek
Geography  History  Medieval Studies
German  Latin  Medieval Studies
Greek  Music  Philosophy
History  Political Science  Religious Studies
Latin  Russian  Social Development
Medieval Studies  Studies  Sociology
Music  Spanish  Greek
Philosophy  Latin  Medieval Studies
Political Science  Music  Philosophy
Psychology  Political Science  Religious Studies
Religious Studies  Russian  Social Development
Russian  Spanish  Greek
Social Development  Studies  Sociology
Studies  Spanish  Greek

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

Classical Civilization  History
Economics  Philosophy
English  Political Science
Fine Arts  Religious Studies
French  Russian
Geography  German/Scientific
German-Russian/Translation  Scientific Translation

There are no minors or double majors in General Programmes.

Note 1

In Year 1, students are encouraged to select an introductory course(s) in any discipline(s) in which they may specialize in later years. For further information on Selection of Year 1 Programmes, refer to page 82.

Note 2

A year course is one which extends for one full academic year (September through April) and carries a minimum of one credit (1.0). A term course lasts only one academic term (fall, winter, or spring) and carries a minimum of one half credit (0.5). Two term courses are the equivalent of a year course.
2) Non-Major
Students with interests in a variety of disciplines may choose an individualized programme rather than major in a single discipline. Any standard first-year Arts programme will satisfy the needs of a student contemplating a General Arts (non-major) Programme. The programme of non-major General Arts students must be arranged through the Arts Faculty Undergraduate Office.

HONOURS PROGRAMMES

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

<table>
<thead>
<tr>
<th>Discipline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anthropology</td>
</tr>
<tr>
<td>Classical Studies</td>
</tr>
<tr>
<td>Drama and Theatre Arts</td>
</tr>
<tr>
<td>Economics</td>
</tr>
<tr>
<td>English</td>
</tr>
<tr>
<td>Fine Arts</td>
</tr>
<tr>
<td>French</td>
</tr>
<tr>
<td>Geography</td>
</tr>
<tr>
<td>German</td>
</tr>
<tr>
<td>History</td>
</tr>
<tr>
<td>Latin</td>
</tr>
<tr>
<td>Medieval Studies</td>
</tr>
<tr>
<td>Music</td>
</tr>
<tr>
<td>Philosophy</td>
</tr>
<tr>
<td>Political Science</td>
</tr>
<tr>
<td>Psychology</td>
</tr>
<tr>
<td>Religious Studies</td>
</tr>
<tr>
<td>Russian</td>
</tr>
<tr>
<td>Slavic Studies</td>
</tr>
<tr>
<td>Social Development</td>
</tr>
<tr>
<td>Studies</td>
</tr>
<tr>
<td>Sociology</td>
</tr>
<tr>
<td>Spanish</td>
</tr>
</tbody>
</table>

Almost any 2 Honours programmes may be combined or 1 Arts Honours programme may be combined with a number of Honours programmes offered in other faculties for a Joint Honours degree. Joint Honours Programmes must be arranged by consultation between the student and the two departments concerned. Descriptions of the single Honours Programmes and each discipline's requirements for Joint Honours Programmes can be found in the section entitled "Departmental Programmes" beginning on p. 87.

Note 1
In Year 1, students are encouraged to select an introductory course(s) in any discipline(s) in which they may specialize in later years. For further information on Selection of Year 1 Programmes, refer to page 82.

2) Co-operative Programmes
A Co-operative Programme is an Honours Programme that allows the student to integrate work experience with his academic programme. (For a detailed description of the co-operative plan, see Chapter 5.) Beginning at the end of Year 1 the co-op student alternates 4-month terms on campus for academic studies with 4 months off campus for practical training in business, industry, or government.

The following co-operative programmes are now offered:

- Applied Studies Co-op (See Note 1)
- Co-op Honours Anthropology
- Co-op Honours Applied Economics
- Co-op Honours Economics with Management Accounting Option
- Co-op Honours Economics with Chartered Accountancy Option
- Co-op Honours English
- Co-op Honours Political Science
- Co-op Honours Political Science Administrative Studies Option
- Co-op Honours Psychology
- Co-op Honours Sociology

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

Note 1
The Applied Studies Co-operative Programme combines an Honours Programme 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 Programmes in Arts at the University may be combined with the Applied Studies courses for this co-operative programme. See the section entitled "Departmental Programmes" for details.

MINOR PROGRAMMES
Students enrolled in Honours Programmes in Arts or other faculties may elect a minor in an Arts discipline. A minor programme in Arts requires the successful completion of 10 term course equivalents 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 programme in that discipline.

Students in an interdisciplinary programme (either major or minor) may not use the same course to meet the minimum requirements of both the major and the minor.
INTERDISCIPLINARY OPTIONS
Students in many Honours Programmes within Arts may choose an interdisciplinary option or minor which will be designated on the diploma. Students in some General Programmes may choose one of several available options. Options are available in: Canadian Studies (Option or Minor, see Chapter 15) Legal Studies (Option, see “Departmental Programmes” and Chapter 15) Management Studies (Joint Honours or Minor, see Chapter 15) Peace and Conflict Studies (Option or Minor, see “Departmental Programmes” and Chapter 15) Personnel and Administrative Studies (Minor, see Chapter 15) Studies in Personality and Religion (Option or Minor, see “Departmental Programmes” and Chapter 15).

SELECTION OF YEAR 1 PROGRAMMES
All Year 1 students are officially classified as being in the General Arts Programme or in the Arts Co-op Programme. Students in both programmes may not select a specific major or an Honours programme until Year 2. The first year is a broad exploratory year, and the student should select a programme 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 1 (see “Applied Studies”, Departmental Programmes). Students in Year 1 usually choose 5 term courses in both the fall and winter terms (or a combination of year and term courses equivalent to 5 term courses per term). Students usually select 2 courses from disciplines in Group A and 2 from disciplines in Group B (see Degree Requirements), with 1 or 2 more courses as electives. As well, students are encouraged to select courses in any discipline in which they may hope to major. (Students are advised that a 6-course work load may be quite heavy.) The Faculty of Arts recommends that its students take at least one course in mathematics or the natural sciences.

Note 1
From time to time, due to space limitations, students admitted to the University or otherwise in good standing, cannot be granted course and programme selections of their choice.

Note 2
Each student’s programme must be approved on or before registration date by a faculty advisor from the Faculty of Arts.

Note 3
Students interested in Social Development Studies should consult the Undergraduate Officer at Renison College before selecting a Year 1 programme.

COURSE AND PROGRAMME CHANGES
1) Changes in courses or programmes must be submitted for approval to the appropriate Undergraduate Officer.

2) Courses may be added during the first three weeks of the term in which they begin only with the signature of the instructor of the course and 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 times, 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 case with reasons showing that such a change in his programme will serve his academic interests.

4) Courses offered during the Summer Session may be added or dropped during the first week in which the course begins only with the signature of the instructor of the course and 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 or third 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 programme 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, 3- or 4-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
- 9 credits in the subject for one area of specialization, or
- 14 credits in two subjects (no fewer than 6 in each) for two areas of specialization.

In addition, the applicant for the HSQ must have completed a Faculty of Education programme and two years' experience teaching in an Ontario high school.

Degree Requirements

In order to earn a BA, a student must complete, with the necessary cumulative averages, the necessary number of prescribed and elective courses for either the General or the Honours Programme.

Students in the three-year General Programme with a major must complete a minimum of 30 term courses or their equivalent with a passing mark in each. Students in a four-year General Programme must complete a minimum of 40 term courses or their equivalent with a passing mark in each. All students in General Programmes 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 programmes require a higher major average) and successfully complete either:

i) a minimum of 16 term courses or their equivalent beyond the 100 level
or
ii) courses from no more than 7 disciplines

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

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

i) a minimum of 15 term courses or their equivalent beyond the 100 level,
ii) a minimum of 15 term courses or their equivalent in the Faculty of Arts,

iii) the Faculty of Arts Group A and B requirements for non-majors (see below).

A cumulative average of 65% is required for graduation in a non-major programme.

Students in an Honours Programme must complete 40 to 46 term courses or their equivalent (as specified in a Departmental Honours Programme), with a passing mark in each and an overall cumulative average in the honours discipline of 75%. The Faculty of Arts Group A and B requirements (see below) must also be met. Students are asked to refer to "Departmental Programmes" for other departmental requirements.

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.

English Language Proficiency Programme

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 Programme. This programme 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 programmes 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.

Note

When students who are completing all their Arts degree requirements through Correspondence courses or at off-campus centres have reached the halfway point toward the General BA degree - that is, when they have finished 15 of their 30 term courses or equivalent - 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 Civilization, Drama, Fine Arts, Music, Religious Studies
Group B Anthropology, Economics, Geography, Political Science, Psychology, Sociology.

In order to complete the Group A and B requirements an Arts student in either a Major or an Honours Programme must complete with passing marks a minimum of 6 term course equivalents from Group A and a minimum of 4 term course equivalents from Group B. No more than 2 of the 4 term courses from Group B may be in the same discipline. The student should note that Group A is further sub-divided into Group A(i), Group A(ii), and Group A(iii). Of the 6 term courses from Group A, the student must complete with passing marks:
- a minimum of 2 term course equivalents from Group A(i)
- a minimum of 2 term course equivalents from Group A(ii)

An Arts student in a Non-Major Programme must complete with passing marks a minimum of 4 term course equivalents from Group A, no more than 2 of which may be in the same discipline, and a minimum of 4 term course equivalents from Group B, no more than 2 of which may be in the same discipline.

Note 1
Religious Studies 106: New Testament Greek may be used to meet the Group A(ii) requirement.

Note 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 one of the following courses: French 291/292, German 271/272, Russian 271/272, Spanish 203/204, Classical Civilization 201/202 or Italian 291/292J. 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.

Examinations and Standings

The following regulations govern final examinations and standings in the Faculty of Arts. These regulations also apply to part-time students and special programmes. Further details concerning University Examination Regulations can be found in Chapter 1, pg. 18.

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 10 term course equivalents are considered Year 1 students; those who have successfully completed at least 10 term course equivalents but fewer than 20 will be considered Year 2 students; those with at least 20 but fewer than 30, Year 3, and those with 30 or more, Year 4.

Final Examinations
1) The Faculty 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 failed 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 striking averages, the following weights will be assigned to grades received in individual courses:

- A+ 95
- B+ 78
- C+ 68
- D+ 58
- F+ 46

- A 89
- B 75
- C 65
- D 55
- F 36

- A- 83
- B- 72
- C- 62
- D- 52
- F- 32

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 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 and add period.

In satisfaction of the minimum degree requirements students in general programmes may present up to 6 term course equivalents with a grade of Credit (Cr) in courses outside their major. Students in Honours Programmes may present up to 8 term course equivalents 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 Type A 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 for a half-course and seven months for a full course.

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.

Course Load
Regular full-time students in both General and Honours Arts programmes normally register for 5 or 6 term courses each academic term. Full-time students in General Arts programmes may register for more than 6 term courses per academic term only with the consent of the Examinations and Standings Committee. Full-time students in Honours Arts programmes may not enrol in more than one term course per academic term in excess of the number specified for their programme (see Departmental Honours Programmes) except with the permission of the Examinations and Standings Committee.

Part-time Studies
Students may pursue degree studies part time (in both General and Honours Programmes) by enrolling in regularly scheduled day courses as well as evening or Saturday courses. In addition, courses may be taken in the six week summer programme 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 programme, 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 56 and 60%, or the major or non-major average below 65% (unless the department specifies a higher average), the student may be granted conditional status for one year. 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 programme, 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 programme 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 may, through his Department Chairman, petition the Examinations and Standings Committee to review his case.

3) Even while otherwise in good standing, a student who fails two or more full courses in any academic year 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, his previous course work does not count in his cumulative average; however, all previous course attempts remain recorded on his University transcript.

5) Students may withdraw before the final day of classes without penalty to their records; however, students who withdraw to avoid a number of failures will likely be ineligible for re-admission for at least two terms.

Dean's List
To recognize outstanding academic achievement the Arts Faculty has established a Dean's List. To be eligible, a student must have completed at least 10 term courses or equivalent while enrolled in a degree programme in the Faculty of Arts and achieved a cumulative overall average greater than or equal to 83.0%. A student with an INC or NMR grade is not eligible.

A student's record is examined once a year in June if the student has completed at least 10 term courses or equivalent. The record is examined again after the completion of a minimum of 10 further term courses from the point of any previous consideration.

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 a student wishes to appeal a course grade, 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 his appeal.

Whether or not a student wishes to proceed informally or formally, he may secure advice and assistance in his 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 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 Committees. 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 a 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 Programmes

Anthropology

General BA in Anthropology
The student must pass ten term courses or equivalent in Anthropology. Eight of these Anthropology courses must be in 200-level courses or above. One term course must be taken in an advanced (200-level or above) course in each of the four sub-disciplines within Anthropology (socio-cultural anthropology, archaeology, linguistics and physical anthropology). Anth 103 may fill the linguistics portion of this last requirement.

Honours Anthropology
The student must pass 20 term courses or equivalent in Anthropology. Eighteen of these Anthropology term courses must be in 200-level courses or above. Two term courses must be taken in advanced (200-level or above) courses in each of the four sub-disciplines within Anthropology (socio-cultural anthropology, archaeology, linguistics, and physical anthropology). Anth 103 may be used to fill all or part of this linguistics requirement. The honour student's programme must also include two term courses in anthropological theory (400-level theory oriented courses). The Anthropology honours student needs 40 term courses or equivalent to graduate.

Honours Anthropology (Applied Studies Co-op)
A student may combine an Honours Anthropology programme 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 88.

Anthropology Joint Honours Programme
The recommended Anthropology programme for Joint Honours includes fourteen term courses in Anthropology. Twelve term courses in Anthropology must be at the 200-level or above, one term course must be taken in an advanced (200-level or above) course in each of the four sub-disciplines within Anthropology (socio-cultural anthropology, archaeology, linguistics, and physical anthropology). Anth 103 may serve to meet the linguistics portion of this requirement. In the Joint Honours programme, students must also include two term courses or equivalent in anthropological theory (400-level theory oriented course).

The student should consult the recommended programmes of other departments to determine their requirements. The Joint Honours student completes forty-four term courses or equivalent before graduation.
Joint Honours Programmes have been approved for Anthropology and Biology, Classical Studies, English, French, Geography, German, History, Man-Environment Studies, Political Science, Psychology and Sociology.

Honours Anthropology (Co-operative) Programme
Co-op Anthropology students will pursue a normal first year Arts programme with two of the ten term courses being in Anthropology. In second year the student will be required to take three of the following courses, or an approved substitute:

- Anth 103 - The Nature of Language or Anth 204 - Language Learning
- Anth 202 - Social Organization
- Anth 260 - Human Evolution

One term course in Archaeology.

The student in second year must also take one of the following courses or an approved substitute:

- Anth 333 - Canadian Communities and Planned Change
- Anth 370 - Ethnographic Field Methods
- Anth 372 - Archaeological Research
- Anth 373 - Archaeological Reporting
- Anth 388 - Applied Anthropology

In addition the student will take two term course Anthropology electives and four term courses or equivalent as "free" electives.

After second year the student is free to follow his or her own interests while fulfilling the departmental degree requirements.

Students are admitted to the programme in their 2A term. Their first work term follows 2B. Work terms and study terms alternate after that. A student must complete 4 successful work terms.

Minor in Anthropology
An honours student may minor in Anthropology. The requirements for an Anthropology minor are identical to the requirements for a General BA in Anthropology.

Note 1
Joint Honours students with Anthropology and Geography or Anthropology and Man-Environment Studies must fulfill the requirements of the Faculty of Arts for the BA degree or of the Faculty of Environmental Studies for the BES degree. Geography requirements will be found under Geography Joint Honours Programmes.

Note 2
Students intending to qualify for the Type A Certificate for teaching high school must elect a minimum of eighteen term courses or equivalent in the specialist field (Anthropology is not a recognized specialist field).

Applied Studies Co-op
A student in the Applied Studies Co-op Programme must maintain good standing in an Honours Programme in Arts and must complete 16 term course equivalents in the area designated Applied Studies. These courses are intended to provide the student with a basic and practical general education and with the skills appropriate to a wide range of careers. Specifically, they are intended to ensure that students in the programme are:

a) capable of clear and precise oral and written communication in English;
b) familiar with the history and political institutions of Canada;
c) familiar with the economic structure and economic institutions of Canada;
d) aware of the impact of science and technology on Canadian society, with a particular awareness of the role of computers and data processing.

Following Year 1, six work terms alternate in regular sequence with six study terms. During each study term, students attend a special seminar designed to integrate their academic Honours Programme with their career interests and with the requirements of their employers.

Recommended Programme

Year 1A
A second language
Economics 193
Arts 198 or CS 112 or 116
Proposed Major Subject and Electives
(3 term courses)

Year 1B
A second language
Economics 194
English 109
Proposed Major Subject and Electives
(3 term courses)

Year 2A
History 253X or Political Science 260A
Economics 181
Major Subject and Electives
(3 term courses)
Year 2B
History 254X or Political Science 260B
Philosophy 145
Science and technology
Major Subject and Electives
(3 term courses)

Year 3A
An approved course in Economics
Psychology 333 or Management Sciences 44
Major Subject and Electives
(4 term courses)

Year 3B
Sociology 231 or Management Sciences 453
or approved option
Major Subject and Electives
(4 term courses)

Year 4A
An approved course in the Applied Studies area
Major Subject and Electives
(4 term courses)

Year 4B
Major Subject and Electives
(5 term courses)

Note 1
Students must have an overall average of 75% in the first term of Year 1 (1A) to remain in the programme.

Note 2
Once a major has been chosen at the end of Year 1, students must maintain an average of at least 75% both in the major field of specialization and in the Applied Studies courses.

Note 3
Upon successful completion of the 44 term courses required in this programme and a minimum of 4 successful work terms a student is granted an Honours degree in the major discipline with an Applied Studies Co-operative Programme designation.


classical studies
(Latin, Greek, Classical Studies, Classical Civilization)

General Programmes
Students choosing a three year General programme in Latin must complete five year course equivalents in Latin (normally not more than one of the five may be a year course equivalent in Classical Civilization). Students choosing a three year General programme in Greek must complete five year course equivalents in Greek (normally not more than one of the five may be a year course equivalent in Classical Civilization). Students choosing a three year General programme in Classical Civilization must complete five year course equivalents in Classical Civilization (normally not more than one of the five may be a year course equivalent in Latin or Greek).

Students choosing a four year General programme in Classical Civilization must complete seven year course equivalents in Classical Civilization (normally not more than two of the seven year course equivalents may be Latin or Greek courses).

Note
Knowledge of neither Latin nor Greek is required to obtain a General degree in Classical Civilization.

Honours Programmes

Honours Classical Studies
Recommended Programme

Year 1
Greek 100, or Latin 100, or Latin 151/152
C Civ 101/102
Three additional year course equivalents

Year 2
Latin 151/152, or one year course equivalent in Latin at the 200 level, or one year course equivalent in Greek at the 200 level
C Civ 251/252, 265/266
Two additional year course equivalents

Year 3
One year course equivalent in Greek or Latin at senior level
C Civ 301/302, 351/352
Two additional year course equivalents

Year 4
Two year course equivalents in Classical Civilization
Three additional year course equivalents
Note 1

In the single honours programme in Classical Studies, three year course equivalents out of ten must be either Greek or Latin or both. Before graduation 20 year course equivalents must be completed.

Honours Classical Studies (Applied Studies Co-op)

A student may combine an Honours Classical Studies programme with Applied Studies Co-op. The requirements in Classical Studies are identical to the Honours requirements listed above. The Applied Studies requirements are listed on page 88.

Joint Honours Classical Studies

Recommended Programme

Year 1
Greek 100 or Latin 100, or Latin 151/152
C Civ 101/102
Three additional year course equivalents

Year 2
Latin 151/152, or one year course equivalent in Latin at the 200 level, or one year course equivalent in Greek at the 200 level
C Civ 251/252, 265/266
Three additional year course equivalents

Year 3
C Civ 301/302, 351/352
Three additional year course equivalents

Year 4
One year course equivalent in Classical Civilization
Five additional year course equivalents

Note 1

In the joint honours programme in Classical Studies, two year course equivalents out of eight must be either Greek or Latin or both. Before graduation 22 year course equivalents must be completed.

Honours Latin

Recommended Programme

Year 1
Latin 100 or 151/152
Four additional year course equivalents

Year 2
Two year course equivalents in Latin
One year course equivalent in Classical Civilization
Two additional year course equivalents

Year 3
Two year course equivalents in Latin
One year course equivalent in Classical Civilization
Two additional year course equivalents

Year 4
Two year course equivalents in Latin
One year course equivalent in Classical Civilization
Two additional year course equivalents

Note

Normally not more than three year course equivalents in Classical Civilization are permitted to complete the total of ten year course equivalents required for Honours Latin. Before graduation 20 year course equivalents must be completed; it is strongly recommended that students complete two of Latin 251/352/451 before graduation.

Honours Latin (Applied Studies Co-op)

A student may combine an Honours Latin programme with Applied Studies Co-op. The requirements in Latin are identical to the Honours requirements listed above. The Applied Studies requirements are listed on page 88.

Joint Honours Latin

Students choosing a Joint Honours Programme involving Latin must complete eight year course equivalents in Latin (normally not more than two year course equivalents in Classical Civilization are permitted to complete the total of eight year course equivalents required for Joint Honours Latin). Before graduation 22 year course equivalents must be completed; it is strongly recommended that students complete two of Latin 251/352/451 before graduation.

Minor Programmes

Minor programmes are offered in Classical Civilization, Greek and Latin. Students interested in planning a sequence of five year course equivalents to complement their major field of study are encouraged to consult the Undergraduate Advisor in Classical Studies. All minor programmes must be approved by the Department.
Drama and Theatre Arts

Sequence of Study
In the first term all students must take Drama 101A and in the second term students must take Drama 101B and Drama 102.

The Honours programme is designed so that a student could work through a particular sequence of courses in one field (acting, academic, 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. Students planning to major in Drama and Theatre Arts should confer with the Undergraduate Advisor before registering.

Drama and Theatre Arts General Programme
1) A total of thirty term course equivalents including Faculty of Arts Groups A and B courses required with an overall cumulative average of at least C- and a cumulative major average of C.
2) At least twelve term course equivalents must be in Drama and Theatre Arts.
3) Drama 101A and 101B are the required prerequisites for most Drama and Theatre Arts courses.
4) In addition students must satisfy the following requirements:
   a) Drama 102
   b) Drama 243
   c) Three of Drama 251, 252, 253, 254, 255, 351, English 362, 363, 190 (See Note).
   d) Drama 371 or Drama 372
   e) Drama 409
   f) Any three other Drama courses or other approved courses in related departments.

Note
A student who has taken English 362/363 may not also take English 190

Honours Drama and Theatre Arts
1) A total of forty term course equivalents including Faculty of Arts Groups A and B requirements with an overall cumulative average of at least C- and a cumulative major average of at least B.
2) At least twenty term course equivalents must be in Drama and Theatre Arts.
3) Drama 101A and 101B are the required prerequisites for most Drama and Theatre Arts courses.
4) In addition students must satisfy the following requirements:
   a) Drama 102
   b) Drama 243
   d) Drama 371 and Drama 372
   e) Six of Drama 251, 252, 253, 254, 255, 351, English 362, 363.
   f) Drama 409
   g) Drama 499 (See Note 3).
   h) Any three other Drama courses or other approved courses in related departments.

Note 1
See Faculty of Arts requirements for other required classes.

Note 2
The Honours BA programme in Drama will enable the student to proceed towards the Ontario College of Education Type A Certificate provided at least four term course equivalents in another teaching subject are acquired (see current calendar requirements).

Note 3
For a description of Drama 499 see Course Descriptions.

Honours Drama and Theatre Arts (Applied Studies Co-op)
A student may combine an Honours Drama and Theatre Arts programme 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 88.

Joint Honours Programmes, Drama and Theatre Arts
1) Fifteen term course equivalents must be in Drama and Theatre Arts.
2) Drama 101A and 101B are the required prerequisite for most Drama and Theatre Arts courses.
3) In addition students must satisfy the following requirements:
   a) Drama 102
   b) Drama 243
   c) Drama 371 and Drama 372
   d) Three of Drama 251, 252, 253, 254, 255, 351, English 362, 363.
   e) Drama 409.
   f) Drama 499. This is a year course. Also see note 4 below.
   g) Three other term courses.

Note 1
Joint Honours programmes other than those already approved may be arranged by consultation with the Drama and Theatre Arts group and the Department concerned.
Note 2
See Faculty of Arts requirements for other required courses.

Note 3
The Joint Honours programme in Drama and another teaching subject will enable the student to proceed towards the Ontario College of Education Combined Type A Certificate.

Note 4
Whether a student does the Senior Seminar (499) or not will depend upon the requirements of other departments. If the other department requires the equivalent of a Senior Seminar of its Joint Honours students the Drama Group would waive the 499 requirement. Instead the student would take any two other Drama classes. If the other department does not have a Senior Seminar requirement then the student may elect to take Drama 499 or two other Drama classes. For a description of Drama 499, see Course Descriptions.

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

Economics

The Department of Economics allows a student to earn an Economics degree in two ways. A student may qualify for the degree in the traditional manner by attending University during the Fall and Winter terms of each year.

The department also provides a co-operative option. This option provides a mix of academic work and on-the-job experience. An honours student may study on a co-operative basis specializing in economic theory and policy or management accounting or chartered accountancy.

Students in Year 1 are required to notify the department of their intention to go into either of the Chartered Accountancy or Management Accounting Options by December 15 of the 1A term. However, those for the Applied Economics Option must notify their intention by March 15.

Advanced Standing Examinations
Early in the fall term the Department of Economics administers a test in Economics 101/102 for students who have completed Economics In Grade 13 and also Economics 191/192 for students who have completed Accounting in Grade 13. Any student who scores at least 70 per cent in either of these tests will be exempted, without any credit accumulated, from Economics 101/102 and/or Economics 191/192 respectively and may register for Economics 201/202 and/or Economics 291/292.

General Economics
Students proceeding to a General Arts degree with a major in Economics are required to take as part of their programme Economics 101/102 or 100a/100b, 201, 202, 231 plus either 211 or 221 and at least four term courses in Economics at the 300 level or above.

Four Year General Programme
Forty term course equivalents are required for the degree. Of these, a minimum of fourteen term course equivalents must be in Economics. The required cumulative major average is 65%. The required Economics courses are Economics 101/102 or 100a/100b, 201, 202, 211 or 221, 231, six term course equivalents at the 300 level or above, plus two additional term course equivalents at the 400 level.

Honours Programmes
Prerequisite
It is desirable, but not mandatory, that students planning to enter Honours Economics should offer a minimum of one Ontario Grade 13 credit in Mathematics or the equivalent.

Honours Economics (Regular, Non Co-op)
Forty term course equivalents are required for the degree. Of these, a minimum of eighteen term course equivalents must be in Economics. The required Economics courses are Economics 101/102, or 100a/100b, 201, 202, 211, 221, 231, 301, 302, 401, 402. In addition students must select one of Economics 181, 191, 241 or 263, and an additional term course in Economics from courses numbered above 300.

Recommended Programme

Year 1
Economics 101/102 or 100a/100b
The equivalent of eight additional term courses*

* Students without Ontario Grade 13 Mathematics or equivalent should select Mathematics 103/104 as an elective.

Year 2
Economics 201, 202, 231
The equivalent of three additional term courses in Economics
The equivalent of four term courses.
Year 3
Economics 301, 302
The equivalent of four additional term courses in Economics.
The equivalent of four additional term courses.

Year 4
Economics 401, 402
The equivalent of two additional term courses in Economics.
The equivalent of six additional term courses.

Honours Programmes with Special Options

Honours Economics (Applied Studies Co-op)
A student may combine an Honours Economics programme 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 88.

Honours Economics with Applied Economics Option (Co-op)
Forty-four term course equivalents are required. The required Economics courses are:
Economics 101/102 or 100a/100b, 181/182 or 191/192, 201, 202, 221, 231, 241, 263, 301, 302, 303, 321, 401, 402, 421, 422. In addition students are required to do two additional term courses numbered above 300.

Note
Students in this programme will be required to do a minimum of two term course equivalents in Mathematics above the level of Mathematics 101, 102 plus Statistics 500.

Recommended Programme

Year 1
Economics 101/102, 181/182 or 191/192
Computer Science 112, 115
English 109 or 150
Math 120A
The equivalent of two additional term courses.

Year 2A
Economics 201, 221, 231
Math 124b
The equivalent of two additional term courses.

Year 2B
Economics 202, 241
The equivalent of four additional term courses.

Year 3A
Economics 263, 302, 321
Statistics 300
The equivalent of two additional term courses.

Year 3B
Economics 301, 303, 421
The equivalent of three additional term courses.

Year 4A
Economics 401, 422
The equivalent of three additional term courses.

Year 4B
Economics 402, 403
The equivalent of three additional term courses.

Honours Economics with Chartered Accountancy Option (Non Co-op and Co-op)
At the end of this programme the student will have completed all of the formal university training required by the Canadian Institute of Chartered Accountants.
The other principal requirements for the C.A. certificate are a minimum of two years of work for a public accounting firm and successful completion of the Provincial Institute's examinations. Forty-four term course equivalents are required in order to receive the degree of Honours Economics with the C.A. option. The following are the required Economics courses.

Analytical Economics:
Economics 101, 102, 201, 202, 211, 221, 231, 301, 302, 303, 321, 401, 402, 421, 422.

Principles of Accounting and Management:
Economics 191, 192, 193, 194, 291, 292, 293, 294, 391, 392, 393, 394, 491, 492, 493.

Note
Students are required to take one additional term course in Economics at the 300 level or above.

Recommended Programme

Year 1
Economics 101/102, 191/192, 193/194
Computer Science 112, 115
English 109
Math 120A
The equivalent of two additional term courses.

Year 2A
Economics 201, 221, 231, 291, 294
The equivalent of one additional term course.
<table>
<thead>
<tr>
<th>Year 2B</th>
<th>Economics 202, 211, 292, 293</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The equivalent of two additional term courses.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 3A</th>
<th>Economics 301, 391</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The equivalent of three term courses.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 3B</th>
<th>Economics 302, 392</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Management Sciences 44</td>
</tr>
<tr>
<td></td>
<td>The equivalent of three additional term courses.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 4A</th>
<th>Economics 393, 491, 493</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The equivalent of three additional term courses.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 4B</th>
<th>Economics 394, 492</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The equivalent of four additional term courses.</td>
</tr>
</tbody>
</table>

**Honours Economics Management Accounting Option (Non Co-op and Co-op)**

Students specializing in management accounting can qualify for twelve R.I.A. exam exemptions, with an opportunity, while still enrolled at University, to write three R.I.A. Uniform National Examinations.

Forty-four term-course equivalents are required for the degree.

The following are the required courses in Economics and Accounting:

**Analytical Economics:** Economics 101, 102, 201, 202, 211, 221, 231, 301, 302, plus two term courses numbered 300 or above.

**Principles of Accounting and Management:** Economics 191, 192, 291, 292, 293, 294, 391, 392, 393, 394, 491, 492, 493.

In addition, students will be required to take Management Science 44.

**Recommended Programme**

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Economics 101/102, 191/192</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Computer Science 112, 115</td>
</tr>
<tr>
<td></td>
<td>English 109</td>
</tr>
<tr>
<td></td>
<td>The equivalent of five additional term courses.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 2A</th>
<th>Economics 201, 221, 231, 291, 294</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The equivalent of one additional term course.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 2B</th>
<th>Economics 202, 211, 292, 293</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The equivalent of two additional term courses.</td>
</tr>
</tbody>
</table>

**Note**

Students in any Economics programme may take Economics 103 instead of Economics 101 to fulfill their degree requirements.

**Joint Honours Programmes**

The courses in economics for any joint honours programme normally are: Economics 101/102 or 100a/100b, 201, 202, 211, 221, 231, 301, 302, 401, 402, plus at least three term-course equivalents in Economics.

In addition, students must meet the requirements of the other department, as well as the Faculty of Arts Groups A and B requirements. Selection of courses will be made with the assistance of the appropriate undergraduate officers. For Joint-Honours Programmes, 44 term course equivalents are required.

Joint-Honours programmes have been approved with Environmental Studies, Geography, German, Political Science, Sociology, Mathematics, and Russian. The following notes pertain:

**Note 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 Economics 221 or Environmental Studies 271 and the above core courses.

**Note 2**

Students are advised to consult the undergraduate officer of both Departments before formulating their programme of study.

**Note 3**

**Economics and Political Science**

Economics 263 must be taken along with the above core courses.
**Note 4**

*Economics and Mathematics*

Substitute Economics 311, 321, for Economics 211, 221. Economics 421, 422 to be included in the above core courses. Students in Years 1 and 2 may take this programme 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 programme must then be approved by the Economics Department or by an appropriate department of the Faculty of Mathematics.

**Note 5**

*Economics and Sociology*

Students may take either Economics 221 or Sociology 202.

**Minor in Economics for Honours Students in other Departments**

Economics 101/102 or 100a/100b, 201, 202, 231, either 211 or 221, plus four additional term-course equivalents in Economics.

---

**English**

**General Programme**

To fulfill the requirements for a General degree in English, a student must gain a total of 15 year courses or equivalent, of which at least 6 must be English Major credits, as follows:

1) 102 or 105 (or equivalent) (See Note 1)
2) 251 (Practice and Theory of Criticism) (See Note 2)
3) 200 (Survey of British Literature) (See Notes 2 and 6)
4) one year course equivalent from 305, 310, 330, 350, 362, 363, 373, 375, 410, 430, 451, 460 (Language and Periods of British Literature)
5) one half course equivalent from 313, 314, 315, 316, 343, 344, 345, 346, 347, 415 (North American Literature)
6) one and a half other English Major course equivalents (See Note 4)

**General Programme (Four Year)**

The English Major course requirements for the four-year General Programme are the same as for the Joint Honours Programme (see below and Notes 1, 2 and 3). Students must maintain a minimum average of 70% in their English Major courses.

**Honours Programme: Regular**

An English Honours student must earn a minimum of 20 year course equivalents before graduation, and these must include at least 10 English Major year course equivalents. These 10 year course equivalents, usually divided 1-3-3-3 among the four years, are as follows:

1) 102 and 105 (or equivalent) (See Note 1)
2) 251 (Practice and Theory of Criticism) (See Note 2)
3) 200 (Survey of British Literature) (See Notes 2 and 6)
4) one year course equivalent from 305, 373, 375, (Language and Early Literature)
5) and 6) two year course equivalents from 310, 330, 350, 362, 363, 410 (British Literature to 1800)
7) one year course equivalent from 430, 451, 460 (British Literature since 1800)
8) one year course equivalent from 313, 314, 315, 316, 343, 344, 345, 346, 347, 415 (North American Literature)
9) and 10) two other English Major year course equivalents (see Notes 3, 4, and 5)

**Honours Programme: Co-operative**

The programme leading to the Degree of Bachelor of Arts in Honours English (Co-operative Programme) is designed for students who intend to enter careers in business, industry, government, or the communication media. Qualified students will ordinarily be admitted to the programme after completion of their first two academic terms at the University of Waterloo and will proceed through the Honours English BA Programme 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 programme are essentially those of the regular Waterloo Honours BA in English.

Students who complete the programme will have had a total of twenty months of practical and relevant 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 in areas 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)**

A student may combine an Honours English programme with Applied Studies Co-op. The requirements in English are identical to the Honours requirements listed above. The Applied Studies requirements are listed on page 88.
Joint Honours Programmes
An English Joint Honours student must earn at least 22 year course equivalents in all, of which at least 8 must be English Major courses as follows:

1) 102 or 105 (or equivalent) (See Note 1)
2) 251 (Practice and Theory of Criticism) (See Note 2)
3) 200 (Survey of British Literature)
   (See Notes 2 and 6)
One year course equivalent from each of the following:
4) 305, 373, 375 (Language and Early Literature)
5) 310, 330, 350, 362, 363, 410 (British Literature to 1800)
6) 430, 451, 460 (British Literature since 1800)
7) 313, 314, 315, 316, 343, 344, 345, 346, 347, 415
   (North American Literature)
8) one other English Major year course equivalent
   (See Notes 3, 4 and 5)

Minor Programme for Students in Other Disciplines
Five year course equivalents in English are required, as follows:

1) 251 (Practice and Theory of Criticism)
   (See Note 2)
2) 200 (Survey of British Literature)
   (See Notes 2 and 6)
3) one English Major year course equivalent numbered 300 or above
4) and 5) two other English Major year course equivalents

Note 1
Although 102 and 105 is recommended for the first year, a student may gain English Major credit from the following English courses without formal permission from the Department: 108, 190. A student may use only one English year course equivalent from 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).

Note 2
English 200 and 251 are strongly recommended for second year.

Note 3
An English Honours student must earn at least 6 English Major year course equivalents numbered 300 or above. English Joint Honours students must gain at least 4 English Major year course equivalents numbered 300 or above, and must maintain a minimum average of 70% (with no more than three half-course equivalent grades below B-) in the English component of their programmes together with an average of at least 75% in both areas of specialization combined. An English Honours student whose major average is below 74.5% at the end of the third year will normally be advised to graduate with a General degree, provided the requirements for it have been met, or transfer to the four-year Programme.

Note 4
All students in Arts must earn a) the equivalent of one year course equivalent either in a language other than English or in a foreign culture, and b) two year courses from Group B (See Degree Requirements, p. 83). The Department of English recommends Classical Civilization 265 and 266 in addition.

Students in the General Programme must gain either a) a minimum of 8 year course equivalents beyond the 100-level, or b) credits from no more than 7 subject fields.

Note 5
English Honours students should confer with their advisors in order to draw up programmes that fulfill official requirements and satisfy the students' own needs and interests as well. For example, students who plan to go on to graduate work would be wise to choose the following English courses: 102, 200, 251, 362/363, 373; 305 or 310; 330 or 350; two of 410, 430, 451, 460; one pair from among 211/212, 232/233; 343 and one of 313/314/315/316. These students might also choose to take 400; or two more courses from 305, 310, 330, 350, 410, 451, 460; or one of the above and two of 344/345/346/347. On the other hand, students who plan to teach high school are advised to take: 102, 200, 251; 373 or 375; 362/363; one of 330, 350, 410, 430, 451; one pair from among 211/212, 232/233, 343/344; two of 313/314/315/316; 415; 400; one more from 305, 310, 330, 350, 373, 375, 410, 430, 451, 460.

Note 6
Students who have taken English 101 in 1980/81 or earlier will not be required to take English 200. If taken, it will not count as an English Major credit.
Fine Arts

General Programme (Studio Option:)
30 term courses or equivalent
A and B requirements – 8 term courses or equivalent
Fine 120/121, 220/221, 222/223, 224/225
Fine 110/111, and additional 2 term art history courses
Electives – 10 term courses or equivalent

General Programme (Art History Option)
30 term courses or equivalent
A and B requirements – 8 term courses or equivalent
Fine 110/111, 210/211, 212/213, 316/317
Fine 120/121 and additional 2 term studio courses
Electives – 10 term courses or equivalent

General Programme (Film Studies Option)
30 term courses or equivalent
A and B requirements – 8 term courses or equivalent
Fine 110/111, 244/245, 232W, 370/371, 470/471 and 344A or 345A
In addition to these courses, at least two term courses in Film, to be selected in consultation with the Fine Arts Film Advisor. These may include Fine 344A, 345A, Fine 246, 248R, 233W and 242W.
Electives – 10 term courses or equivalent.

Note:
Fine 390, 391, 392, 393 may be taken only as electives.

Four Year General Programme (Studio Option)
40 term courses or equivalent.
A and B requirements – 8 term courses or equivalent.
Fine 120/121, 220/221, 222/223, 224/225
Fine 110/111, and additional 2 term art history courses
4 term courses in Fine Arts on the 3rd or 4th year level, one of which must be 490a
Electives – 16 term courses or equivalent

Four Year General Programme (Art History Option)
40 term courses or equivalent.
A and B requirements – 8 term courses or equivalent
Fine 110/111, 210/211, 212/213, 316/317
Fine 120/121, and additional 2 term studio courses
4 term courses in Fine Arts on the 3rd or 4th year level, one of which must be 490a.
Electives – 16 term courses or equivalent.

To graduate with a 4 year General Degree in Fine Arts, it is necessary to complete Fine 490a.
Admission to this course is by portfolio or art history presentation, submitted after successfully completing 3rd year.

Note:
Fine 390, 391, 392, 393, 472, and 473 may be taken only as electives.

Honours Programme (Studio Option)
40 term courses or equivalent
A and B requirements – 8 term courses or equivalent
Fine 120/121, 220/221, 222/223, 224/225
Fine 110/111, and additional 4 term art history courses
4 term studio courses on the 3rd year level chosen from the following list:
Fine 324, 325, 320, 321, 322, 323
Fine 490/491
Electives – 12 term courses or equivalent.

Honours Programme (Art History Option)
40 term courses or equivalent
A and B requirements – 8 term courses or equivalent
Fine 110/111, 210/211, 212/213, 316/317
Fine 120/121, and additional 2 term studio courses
6 term art history courses on the 2nd or 3rd year level
Fine 490/491
Electives – 12 term courses or equivalent

Honours Programme (Film Studies Option)
40 term courses or equivalent
A and B requirements – 8 term courses or equivalent
In addition to these courses, at least 5 term courses in Film to be selected in consultation with the Fine Arts Film Advisor. These may include Fine 246, 248R, 233W and 242W.
Electives – 12 term courses or equivalent.

To graduate with an Honours degree in Fine Arts, it is necessary to complete Fine Arts 490/491.
Admission to this course is by portfolio or art history presentation, submitted after successfully completing 3rd year. This is to ensure that students are capable of carrying out their proposed course of study.

All other 4th year courses are open to students who have completed 3rd year courses or are otherwise qualified.

Note:
Fine 390, 391, 392, 393, 472, and 473 may be taken only as electives.
Honours Fine Arts (Applied Studies Co-op)
A student may combine an Honours Fine Arts programme 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 88.

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

Minor Programme (Studio or Art History Option:)
10 term Fine Arts courses, in addition to your major programme, including:
Fine 110/111, 120/121

Minor Programme (Film Studies Option:)
10 term Fine Arts courses, in addition to your major programme, including:
Fine 110/111, 244/245, 232W, 470/471 and 344A/345A or 370/371

French

General Programme in French
Students in the three year general programme in French must complete six year course equivalents in French of which at least three year course equivalents are on the 300 or 400 levels.

Honours Programme in French
Students in the honours programme in French must complete before graduation the equivalent of ten year course equivalents in French of which at least six year course equivalents are on the 300 or 400 level.\textsuperscript{15}

Recommended Programme

\textbf{Year 1}
French 191/2
Four additional year course equivalents

\textbf{Note:}
Students taking this course who wish to major or honour in French are strongly urged to enrol in Fr 195/196 as well.

\textbf{Year 2}
A minimum of French 250H or its equivalent, French 231, French 253, French 274, plus another term course in French
Two additional year course equivalents

Honours French (Applied Studies Co-op)
Students may combine an Honours French programme 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 88.

French in Joint Honours Programmes
The Department of French recognizes combined honours programmes with the following disciplines:

Classical Studies
English
German
History
Latin
Man-Environment
Mathematics

Philosophy
Political Science
Psychology
Russian
Sociology
Spanish

Other combinations must be approved on an individual basis with the departments concerned.

Students registered in a Joint Honours Programme involving French must complete the equivalent of eight year course equivalents in French (in the case of Political Science only seven are required) of which at least 4 in French are on the 300 or 400 levels.
Recommended Programme

Year 1
French 192
Four additional year course equivalents

Note:
Students taking this course who wish to major or honour in French are strongly urged to enrol in French 195/196 as well.

Year 2
A minimum of French 250H or its equivalent, French 231, French 253, French 274, plus another term course in French

Year 3
A minimum of French 300 or its equivalent, French 342, French 363

Year 4
A minimum of French 401/402 or their equivalent plus one additional year course equivalent in French

Note 1
A total of 22 year-course equivalents must be successfully completed before graduation.

Note 2
Students in Year 4 must have the permission of the department to enrol in French courses on the 100-200 level.

Minor Programme in French
A minor programme in French will consist of five year course equivalents in French Language and/or Literature. Students must demonstrate written and oral ability in French equal to that expected in French 300.

Minor Programme in Business French
A minor programme in Business French will consist of a minimum of five year course equivalents in French. Students must demonstrate written and oral ability in French equal to that expected in French 300.

Geography

Admission to the programmes in Geography in the Faculty of Arts is gained in second year. Those interested should ensure that they take the appropriate Geography courses in first year.

General Geography

A) Three Year General Programme

Year 1
Geog 101 Introduction to Human Geography
Geog 102 Introduction to Physical Geography
Geog 110 Introduction to the Field of Geography
and one but no more than two of:
Geog 125R Introduction to the Developing World
Geog 126R Development in the Third World
Geog 127 Regional Problems of Europe
Env St 195A Introduction to Environmental Studies,
or
Env St 195B Introduction to Environmental Problems
Additional electives to make a maximum of no more than 11 half-courses in all.

Year 2
Env St 200 Field Ecology
Geog 201 Some Basic Topics of Physical Geography
Geog 202 Some Basic Topics of Economic and Urban Geography
and one of:
Geog 203 Some Basic Topics of Cultural and Regional Geography
Geog 204  Soviet Union
Geog 205  Africa
Geog 220  World Regional Geography
Geog 221  The United States

and additional credits so that a student should have completed by the end of the second year 11 full credits.

Year 3
Geog 301  The Nature of Geography

Additional credits so that a student will have completed at least 16 credits of which at least 6 are in Geography.

B) Four Year General Programme

Year 1
Geog 101  Introduction to Human Geography
Geog 102  Introduction to Physical Geography
Geog 110  Introduction to the Field of Geography

and one but not more than two of:

Env St 195A Introduction to Environmental Studies
Env St 195B Introduction to Environmental Problems
Geog 125R Introduction to the Developing World
Geog 126R Development in the Third World
Geog 127  Regional Problems of Europe

and additional credits to a maximum of six.

Year 2
Env St 200  Field Ecology
Geog 201  Some Basic Topics of Physical Geography
Geog 202  Some Basic Topics of Economic and Urban Geography

one of:

Geog 203  Some Basic Topics of Cultural and Regional Geography
Geog 204  Soviet Union
Geog 205  Africa
Geog 220  World Regional Geography
Geog 221  The United States

one of:

Geog 260  Introduction to Cartography and Map Analysis
Geog 275  Introductory Air Photo Analysis and Remote Sensing
Env St 271  Introduction to Quantitative Research Methods

and additional credits so that a student should have completed by the end of second year 11 credits.

Years 3 and 4
Geog 381  The Nature of Geography

one of:

Geog 260  Introduction to Cartography and Map Analysis
Geog 275  Introductory Air Photo Analysis and Remote Sensing
Env St 271  Introduction to Quantitative Research Methods

and two full credits in Geography at the 300 level or above.

Additional credits so that a student will have completed at least 21 credits of which at least 9 are in Geography and 4 are outside the Faculty of Environmental Studies.

Notes on General Programme (3 year and 4 year)

Note 1
Sixteen credits is the minimum requirement for the three year General Degree of Bachelor of Arts; twenty-one credits is the minimum for the four year General Degree.

Note 2
In the three year programme a minimum of six credits in Geography constitutes a Geography major. One of these six credits may be designated as Environmental Studies. In the four year programme a minimum of nine credits in Geography constitutes a Geography major. One and one-half of these credits may be designated Environmental Studies. Students in both programmes may choose additional Geography electives, and are encouraged to do so.

Note 3
Students must maintain an overall average of C(60.0) with a major average of C (65.0).

Honours Geography

Year 1
Geog 101  Introduction to Human Geography
Geog 102  Introduction to Physical Geography
Geog 110  Introduction to the Field of Geography
Math 105  Math for Environmental Studies
(only if no Grade 13 Math)

and one of, but not more than two of:

Env St 195A Introduction to Environmental Studies
Env St 195B Introduction to Environmental Problems
Geog 125R Introduction to the Developing World
Geog 126R Development in the Third World
Geog 127  Regional Problems of Europe
Additional credits should be chosen after consultation with the department so that the student has 12 half-courses.

Year 2

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Env S 200</td>
<td>Field Ecology</td>
</tr>
<tr>
<td>Geog 201</td>
<td>Some Basic Topics of Physical Geography</td>
</tr>
<tr>
<td>Geog 202</td>
<td>Some Basic Topics of Economic and Urban Geography</td>
</tr>
<tr>
<td>Geog 260</td>
<td>Introduction to Cartography and Map Analysis</td>
</tr>
<tr>
<td>Geog 275</td>
<td>Introductory Air Photo Analysis and Remote Sensing</td>
</tr>
<tr>
<td>Env S 271</td>
<td>Introduction to Quantitative Research Methods</td>
</tr>
</tbody>
</table>

and one of:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geog 203</td>
<td>Some Basic Topics of Cultural and Regional Geography</td>
</tr>
<tr>
<td>Geog 204</td>
<td>Soviet Union</td>
</tr>
<tr>
<td>Geog 205</td>
<td>Africa</td>
</tr>
<tr>
<td>Geog 220</td>
<td>World Regional Geography</td>
</tr>
<tr>
<td>Geog 221</td>
<td>The United States</td>
</tr>
</tbody>
</table>

and additional credits so that a student should have completed by end of the second year a minimum of 12 full credits.

Year 3

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geog 381</td>
<td>The Nature of Geography</td>
</tr>
<tr>
<td>Geog 390</td>
<td>Senior Honours Research Essay Proposal</td>
</tr>
<tr>
<td>Geog 391</td>
<td>Field Research</td>
</tr>
</tbody>
</table>

and one of:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geog 316</td>
<td>Multivariate Statistics</td>
</tr>
<tr>
<td>Geog 317</td>
<td>Nonparametric Statistics</td>
</tr>
<tr>
<td>Geog 318</td>
<td>Spatial Analysis</td>
</tr>
</tbody>
</table>

One credit of Geography electives. Three credits chosen after consultation with the Department.

Year 4

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geog 490A</td>
<td>Senior Honours Research Essay</td>
</tr>
</tbody>
</table>

and additional course credits so that a student should have a minimum of 24 full credits of which at least 11 are in Geography and Environmental Studies.

Notes on Honours Programme

Note 1
Twenty-four full credits is the minimum requirement for the degree Bachelor of Arts (Honours Geography). Honours Geography students must therefore ensure that, in addition to the courses required for the degree as outlined above, they take additional courses as electives to average at least six credits per academic year.

Note 2
Students are required to take a minimum of eleven credits in Geography. Two of these credits may be courses designated as Environmental Studies (p. 323).

Note 3
To enter Year 2 of the Honours Geography programme, a student must achieve in Year 1 a minimum overall average of B- (70.0) and an average of B (75.0) in Geography and Environmental Studies courses. In subsequent years, a student must continue to achieve an overall average of B- (70.0) and an average of B (75.0) in Geography and Environmental Studies courses.

Note 4
For students wishing to specialize, the Department offers a series of options. Students meeting the requirements of an option (which are additional to the core requirements identified above), will have that option designated on their official university transcript.

Note 5
Since many departments offering graduate work in Geography demand proficiency in a foreign language, students intent on graduate work should consider taking at least one credit in a foreign language.

Note 6
Students intending to teach in Secondary Schools are advised to take at least two credits of Regional Geography.

Note 7
This programme prepares students for graduate study in Geography or in Planning, for entry to Secondary School teaching, or for research positions in industry, commerce and government.

Note 8
All Geography students in the regular programme are encouraged to take summer employment which will provide experience useful to a geographer. Where possible, the Environmental Studies Placement Office will provide information and
assistance in securing such summer employment. Co-op Geography students will gain appropriate employment experience as part of their degree requirements.

Note 9
For some courses, participating students may be expected to make a financial contribution to defray heavy equipment/travel costs, e.g. Geog 391 (Field Research), which is mandatory for all third year regular honours students. Statements on fees, where required, will be found with the course description (p. 341).

Note 10
No more than one and one-half credits may be taken as reading courses in Geography.

Honours Geography Options
(see p. 165-167).

Geography Joint Honours and Minor Programmes
(see p. 167-168).

German

The Department of Germanic and Slavic Languages and Literatures offers the following programmes in German:

Honours Programme in German
Joint Honours Programme in German
General Programme in German
Minor Programme in German
German and Russian/Scientific Translation Programme

Students entering German Programmes are normally placed in one of two streams (A and B), depending upon their knowledge of the German language.

<table>
<thead>
<tr>
<th>Stream A</th>
<th>Stream B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students with little or no knowledge of German</td>
<td>Students with at least two years of High School German</td>
</tr>
</tbody>
</table>

First Year
Ger 101/102 or
Ger 105/106 or
Ger 111/112

Second Year
Ger 201/202 or
Ger 211/212

Note 1
Before graduation all students must complete Ger 291/292, normally in year 2.

Note 2
Although students may take both Ger 121/122 and Ger 151/152, only one of these courses may count toward the Major or Honours requirement in German.

Note 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.

Honours German
Eligibility for graduation in the Honours German Programme includes fulfilment of the following requirements:

1) Successful completion of a minimum of 20 year course equivalents, of which at least 10 year course equivalents must be in German.

2) An overall cumulative average of 60% and a cumulative average of 75% in the German courses.

3) Completion of the Faculty of Arts Group requirements.

With the permission of the Department a student may spend one of the senior years at a university of a German-speaking country, preferably at the University of Mannheim in the “Waterloo in Germany” Programme.

Honours German (Applied Studies Co-op)
A student may combine an Honours German programme with Applied Studies Co-op. The requirements in German are identical to the Honours requirements listed above. The Applied Studies requirements are listed on page 88.
Waterloo in Germany Programme
The Department offers a yearly programme of studies at the University of Mannheim on the Rhine. The programme 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.

German Joint Honours Programmes
Eligibility for graduation in a German Joint Honours Programme includes fulfillment of the following requirements:

1) Successful completion of a minimum of 22 year course equivalents, of which at least 8 year course equivalents must be in German.

2) An overall cumulative average of 60% and a cumulative average of 75% in each of the two Honours disciplines.

3) Completion of the Faculty of Arts Group Requirements.

A Joint Honours Programme in German may be taken in combination with any other discipline in which an Honours Programme is offered, subject to approval by the Departments concerned. Some representative Joint Honours Programmes are:

- German and Economics
- German and English
- German and French
- German and Geography
- German and History
- German and Russian

General Programme in German
Eligibility for graduation in the General Programme in German includes fulfillment of the following requirements:

1) Successful completion of a minimum of 15 year course equivalents, of which at least 6 year course equivalents must be in German.

2) An overall cumulative average of 60% and a cumulative average of 65% in the German courses.

3) Completion of the Faculty of Arts Group Requirements.

Minor Programme 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 5 year course equivalents in German with an overall cumulative average of at least 65% in those courses, of which:

- a) not more than 2 year course equivalents may be chosen from courses on the 100 level, and
- b) at least one year course equivalent must be chosen from courses above the 200 level.

German and Russian/Scientific Translation Programme
German and Russian/Scientific Translation is a four-year General Programme designed for students who wish to specialize in the field of translation of scholarly texts in the arts and sciences. Eligibility for graduation in this programme includes fulfillment of the following requirements:

1) Successful completion of a minimum of 20 year course equivalents, of which:
   - a) 7 year course equivalents must be approved courses in German,
   - b) 4 year course equivalents must be approved courses in Russian,
   - c) 6 year course equivalents must be in the sciences and/or mathematics.

2) An overall cumulative average of 60% and a cumulative average of 65% in the primary and secondary languages.

3) Completion of the Faculty of Arts Group Requirements.

Greek (see Classical Studies)
History

The Department of History offers the following programmes:

Three-Year General Programme
Four-Year General Programme
Honours Programme
Honours History Applied Studies Co-op Programme
History Joint Honours Programmes
Minor Programme

Students in the first five of these programmes must fulfill the degree requirements of the Faculty of Arts set out earlier in this chapter. Students should work out their specific programme with a departmental advisor.

Note that all history courses at the 100, 200 and 300 levels are term-courses, with a course credit of 0.5. Courses at the 400 level (Senior Seminars) have a course credit of 1.0.

Three-Year General Programme
Students must complete ten term-courses in History, with at least two at the 300 level and no more than two at the 100 level.

Four-Year General Programme
Students must complete fourteen term-courses in History, with at least two at the 300 level and no more than two at the 100 level. They must maintain a C average (65.0%) in history courses.

Honours Programme
Students must complete sixteen term-courses and two Senior Seminars in History with a B average (75.0%). No more than two term-courses may be at the 100 level and no more than four may be in the 220-230 range. The Department of History's Undergraduate Officer is responsible for ensuring that individual programmes are not too narrowly specialized.

Recommended Programme

Year 1
Any first year programme that fulfills the Faculty of Arts requirements is acceptable. We recommend:

History 100.
One of History 102A-N
Political Science 101
Seven other term-courses

Year 2
Six term courses in History.
Six other term courses.

Note:
C Civ 251 and C Civ 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. Either C Civ 480 or C Civ 490 (but not both) will be accepted for credit as a year-course in History, but will not be accepted as a Senior Seminar in History.

Honours History (Applied Studies Co-op)
A student may combine an Honours History programme with Applied Studies Co-op. The requirements in History are identical to the Honours requirements listed above. The Applied Studies requirements are listed on page 88.

History Joint Honours Programmes
Joint honours programmes are available in History and Anthropology, Classical Studies, Drama, Economics, English, Fine Arts, French, Geography, German, Philosophy, Political Science, Psychology, Religious Studies, Russian, Spanish and Sociology. The Department of History would consider arranging others for keenly interested students. The History Honours programme may also be combined with concentrations in Canadian Studies, Legal Studies, or Peace and Conflict Studies.

Students in these programmes must complete 22 course credits (the equivalent of 44 term-courses), including ten term-courses and two Senior Seminars in History.

Minor Programme
To qualify for a Minor in History, students must complete ten term-courses in History, with at least two at the 300 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 the Department of History's Undergraduate Officer.

Italian

Minor Programme
A minor programme in Italian is available. Interested students should see the Advisor for Italian at St. Jerome's College.
Legal Studies Option

Legal Studies is an interdisciplinary programme that focuses on law primarily from a liberal arts 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 History, Philosophy, Political Science, Sociology, Economics, and Environmental Studies. Students are invited to join in these scholarly investigations. The liberal arts orientation of this programme 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.

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 programme. It is strongly urged that students consult the Legal Studies Undergraduate Advisor in making their course selections from Sections Two and Three.

The Legal Studies option is open to students in General or Honours programmes. 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. See the Legal Studies Course Descriptions in Chapter 15 for further details of the requirements.

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 B.A. in Medieval Studies. Such a degree is designed to provide a general awareness of our cultural heritage. In addition, the programme is flexible enough to prepare students for careers in teaching, or for the pursuance of a graduate degree.

The Medieval Studies Programme 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.

The General Programme

For the core of a Medieval Studies Programme, each student must take seven year course equivalents from a list of approved courses, including at least one year course equivalent from each of four of the eight subject fields specified.

The Honours Programme

For the core of the Medieval Studies Programme, each student must take eight year course equivalents from a list of approved courses, including at least one year course equivalent from each of five of the eight subject fields specified.


Honours Medieval Studies (Applied Studies Co-op)

A student may combine an Honours Medieval Studies programme 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 88.
Music

General Programme
31 term course equivalents

In addition, students must demonstrate competence on one instrument (or voice) equal to Grade 10 standing at the Royal Conservatory of Music of Toronto. Normally this is attained through taking Music Studio courses – Music 266G/267G, 366G/367G.

Honours Programme
41.5 term course equivalents

In addition, students must demonstrate competence on one instrument (or voice) equal to Grade 10 standing at the Royal Conservatory of Music of Toronto. Normally this is attained through taking Music Studio courses – Music 266G/267G, 366G/367G.

Joint Honours Programme
45.5 term course equivalents
17.5 term course equivalents in Music
Specific requirements for each honours programme are available from the Department.

Minor Programme

Peace and Conflict Studies

Peace and Conflict Studies (“PACS”) is an interdisciplinary programme 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 programme 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 Programme: 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 Programme will take the PACS Core Courses as well as a specified number of "PACS Content Courses" 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 five year course equivalents in the major field), the general arts student must meet the following PACS requirements:
a) PACS 201, 202, 301, and 302.
b) Six term course equivalents chosen from the PACS Content Courses offered by either the department in which the student majors, or any other departments.

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 Programme (Peace and Conflict Studies)
A student may choose straight or joint honours in any of the participating departments. The student is granted, upon completion of his 22 year course equivalent programme (23 year course equivalents if joint honours), an Honours B.A. or B.E.S. in his subject area with the subtitle Peace and Conflict Studies.

In addition to fulfilling the degree requirements in his department, each student must meet the following PACS requirements in his 4-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 course equivalents chosen from among the PACS Content Courses offered by the student's department (eight term course equivalents if joint honours). These courses may also be used to meet the department's honours requirements if approved as such by the department. (See note).

c) Three term course equivalents 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 five year course equivalents chosen from among the courses approved for PACS credit in any department, and must include PACS 201, 202, 301, and 302.

Note
Each of the participating departments has designated certain course offerings as Peace and Conflict Studies content courses. These courses are listed in Chapter 15 of the Calendar. 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.

Philosophy

Three Year General Degree in Philosophy
Fifteen year course equivalents (30 term courses) of which five year course equivalents must be in Philosophy including:
a) one of 140, 145, 241, 242, 243, or 340
b) 221

c) one year course equivalent from 280/281, 282/283, 284/285, or 390/391

Students registered at St. Jerome's in General Philosophy must take fifteen year course equivalents (30 term courses) of which five year course equivalents must be in Philosophy including:
a) one of 200J, 140, 145, 241, 242, 243, or 340
b) 218J, or 221

c) one year course equivalent from 280/281, 282/283, 284/285, or 390/391

Four Year General Degree in Philosophy
Students must satisfy the Three Year General Degree in Philosophy requirements (see above) and complete five more year course equivalents, two of which must be in Philosophy. An overall average of 68% is required.

Students registered at St. Jerome's in Philosophy must meet the same requirements to earn a Four Year General Degree. See the second paragraph under the above section for the appropriate list of required Philosophy courses.

Minor
Five year course equivalents (10 term courses) in Philosophy approved by the Department

Honours Degree in Philosophy
Twenty year course equivalents (40 term courses) are required of which ten year course equivalents must be in Philosophy including:
a) one of 241, 242, 243, or 340
b) 221/222
c) 280/281, 282/283
d) 499

e) College students are expected to take 450J
Honours Philosophy (Applied Studies Co-op)
A student may combine an Honours Philosophy programme with Applied Studies Co-op. The requirements in Philosophy are identical to the Honours requirements listed above. The Applied Studies requirements are listed on page 88.

Philosophy Joint Honours Programmes
These usually consist of seven year course equivalents in Philosophy and seven year course equivalents in the other subject. A total of twenty-two year course equivalents is required. The Philosophy courses ordinarily include:
a) one or two of 140, 241, 242, 243, or 340 (depending on the Programme)
b) 221/222
c) 280/281, 282/283
d) a Philosophy course which is relevant to the other subject (e.g. Aesthetics for Philosophy and English)
e) A senior honours essay is written in either Philosophy 499 or in the other subject.

There are currently joint honours programmes in Philosophy and the following: Economics, English, History, Latin, Literature (French, German, or Russian), Mathematics, Political Science, Psychology, Religious Studies, Social Development Studies, and Sociology.

The Undergraduate Advisor in Philosophy should be consulted for details of these and other Philosophy programmes.

Students registered at St. Jerome's in a Philosophy Joint Honours Programme may substitute St. Jerome's Philosophy Courses in the same way as for the Philosophy Honours Programme.

Options
The following options are available to students majoring in Philosophy: Legal Studies, Peace and Conflict Studies, and Studies in Personality and Religion. Check the appropriate Calendar entry for further details.

Political Science
While students in Arts do not choose a major until the end of the first year, many have some idea of the area in which they wish to study. Those students who intend to major in Political Science may wish some guidance in the selection of the first year courses. The Department would recommend the following programme for such students:

Political Science 101/102
Economics 101/102 or Economics 100a/100b
Sociology 102/205
History - the equivalent of one year course
One other year course equivalent, chosen from Group A

By no means should the above recommendations be considered mandatory: while these courses constitute, on the whole, the best overall background for the study of politics, students who wish to pursue interests in other disciplines are free to do so.

The Department of Political Science offers a series of undergraduate programmes designed to meet the needs of students with varying interests. Requirements for each programme are restricted to the completion of a specified number of courses in different fields of the discipline before graduation. For these purposes Political Science courses above the 100 level are numbered according to the field within which they fall.

The key to this scheme is the second digit of the course number as follows:
1 - methodology
2 - normative theory
3 - public administration, public law, and public policy
4 - local and regional politics
5 - comparative politics (more than one country)
6 - comparative politics (specific countries)
7 - the political process
8 - international politics
with the number 9 reserved for special courses which are not regarded as dealing with a particular field of the discipline. PSci 291, 292, 293 are non-programme courses (see Note, p. 111).

1) Three Year General Programme
Students choosing a three-year General programme in Political Science will normally complete, before graduation, the equivalent of five year courses in Political Science beyond the 100 level, of which there must be at least one term course from each of four different fields of the discipline as defined above. At least two year course equivalents must be taken at the 300 level or higher.
2) Four Year General Programme
Students choosing a four-year General programme in Political Science must complete, before graduation, the equivalent of eight year courses in Political Science beyond the 100 level and maintain a cumulative average in these courses of 70%. Remaining programme requirements are the same as those for the four-year Honours Programme.

3) Honours Programme
Students choosing an Honours programme in Political Science must complete, before graduation, the equivalent of nine year courses in Political Science beyond the 100 level, of which four must be from different fields of the discipline as defined above. At least two year course equivalents must be taken at the 400 level.

Honours Political Science

Recommended Programme

Year 1
Political Science 101/102
The equivalent of four other year courses

Year 2
The equivalent of three year courses in Political Science (see note)
The equivalent of two other year courses

Year 3
The equivalent of three year courses in Political Science (see note)
The equivalent of two other year courses

Year 4
The equivalent of three year courses in Political Science at least two of which must be at the 400 level (see note)
The equivalent of two other year courses

Note
Among the nine Political Science year course equivalents above the 100 level, students must select four year course equivalents from the different fields of the discipline and two year course equivalents must be taken at the 400 level.

4) Honours Political Science
(Administrative Studies Option)

This programme consists of courses which would ordinarily lead to an Honours degree in Political Science, together with the following core courses:
1) Economics 101/102 or Economics 100a/100b
2) Economics 191 or Economics 181 or Economics 193
3) Economics 192 or Economics 182 or Economics 194
4) Psychology 333 or Management Sciences 44 or Sociology 231
5) English 210

An Honours Programme with the Administrative Studies Option, in addition to the core courses, must include:
1) The equivalent of at least three year courses in Political Science beyond the 100 level, selected from courses which have been designated as Administrative Studies courses by the Department; and
2) The equivalent of at least two year courses beyond the 100 level not in Political Science, selected from courses which have been designated as Administrative Studies courses by the Department.

Honours Political Science
(Administrative Studies Option) after Year 1

Year 2
1 term course
Economics 191 or Economics 181 or Economics 193
1 term course
English 210
3 year course equivalents
from the major subject, one of which must be in a designated Administrative Studies course.
2 year course equivalents
electives
Total 6 year course equivalents

Year 3
1 term course
Economics 192 or Economics 182 or Economics 194
1 term course
Psychology 333 or Sociology 231 (unless Management Sciences 44 is to be taken in Year 4)
3 year course equivalents
from the major subject, one of which must be in a designated Administrative Studies course.
2 year course equivalents
electives, one chosen from designated
Administrative Studies courses not in the major subject.
Total 6 year course equivalents

Year 4
1 term course
Management Sciences 44 (unless Psychology 333 or Sociology 231 was taken in Year 3)
3 year course equivalents
from the major subject: one of which must be in a designated Administrative Studies course.
3 term courses
electives, one chosen from designated Administrative Studies courses not in the major subject.
Total 5 year course equivalents

Total year course equivalents in the programme: 22

Note
Students in Honours Political Science (Administrative Studies Option) must achieve an overall cumulative average of 75% in all core and designated Administrative Studies courses.

5) Co-operative Programme in Honours Political Science
The programme leading to the Degree of Bachelor of Arts in Honours Political Science (co-operative programme) 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 programme after completion of their first two academic terms. The programme consists of six further academic terms and a minimum of four paid work terms with participating employers.

The academic requirements of the co-operative programme are identical with those of the regular Honours programme in political science. The programme is open to students enrolled in either the regular Honours Political Science programme or Honours Political Science (Administrative Studies Option).

The first work term of the co-operative programme occurs after the successful completion of Year 2 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.

6) Honours Political Science (Applied Studies Co-op)
A student may combine an Honours Political Science programme with Applied Studies Co-op. The requirements in Political Science are identical to the Honours requirements listed above. The Applied Studies requirements are listed on page 90. Students planning to enrol in Honours Political Science (Applied Studies Co-op) should consult the Department's Co-op Officer.

7) Joint Honours Programme
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 programme.

It is possible to combine the Political Science joint honours requirements with the requirements made by Anthropology, Economics, English, French, Geography, History, Man-Environment, Philosophy, Psychology or Sociology. In a joint honours programme involving a Department in another Faculty, as in the Political Science and Man-Environment programme, students will fulfill the degree requirements of the Faculty in which they are registered. For a joint honours programme in any other discipline, please consult the Political Science Department and the other department concerned.

Students choosing a joint Honours programme involving Political Science must complete, before graduation, the equivalent of six year courses in Political Science beyond the 100 level of which there must be at least one term course from each of four different fields of the discipline as defined above.

Political Science Joint Honours Programme

Recommended Programme

Year 1
Political Science 101/102
Introductory year course equivalent in the other discipline
The equivalent of three other year courses

Year 2
The equivalent of two year courses in Political Science (see note)
The equivalent of two year courses in the other discipline
The equivalent of two other year courses

Year 3
The equivalent of two year courses in Political Science (see note)
The equivalent of two year courses in the other discipline
The equivalent of two other year courses
### Year 4

- The equivalent of two year courses in Political Science, at least one of which must be at the 400 level (see note)
- The equivalent of two year courses in the other discipline
- The equivalent of one other year course

#### Note

Among the six Political Science year course equivalents above the 100 level, students must select at least one term course in each of four different fields of the discipline. For further information on this please consult the Department.

### 8) Joint Honours Political Science (Administrative Studies Option)

The programme consists of the successful completion of courses which would ordinarily lead to a Joint Honours degree in Political Science and another discipline and the following core courses:

1. Economics 101/102 or Economics 100a/100b
2. Economics 191 or Economics 181 or Economics 193
3. Economics 192 or Economics 182 or Economics 194
4. Psychology 333 or Management Sciences 44 or Sociology 231
5. English 210

In addition a Joint Honours Programme with the Administrative Studies Option must include:

1. The equivalent of at least three year courses beyond the 100 level in each of the student's major subjects selected from courses in those subjects which have been designated as Administrative Studies courses by the Department; and
2. The equivalent of at least two year courses beyond the 100 level not in either of the student's major subjects selected from courses which have been designated as Administrative Studies courses by the Department.

### Joint Honours Political Science (Administrative Studies Option) after Year 1

- 1 term course
  - Economics 191 or Economics 181 or Economics 193
- 1 term course
  - English 210
- 4 year course equivalents
  - two in each of the major subjects; one of each major subject must be an Administrative Studies course

### Year 3

1. 1 term course
   - Economics 192 or Economics 182 or Economics 194
2. 1 term course
   - Psychology 333 or Sociology 231 (unless Management Sciences 44 is to be taken in Year 4)
3. 4 year course equivalents
   - two in each of the major subjects; one of each major subject must be an Administrative Studies course
4. 1 year course equivalent
   - elective, chosen from designated Administrative Studies courses, not in the major subjects.

### Total 6 year course equivalents

### Year 4

1. 1 term course
   - Management Sciences 44 (unless Psychology 333 or Sociology 231 was taken in Year 3).
2. 4 year course equivalents
   - two in each of the major subjects; one of each major subject must be an Administrative Studies course
3. 3 term courses
   - electives, one chosen from designated Administrative Studies courses not in the major subjects.

### Total 6 year course equivalents

### Total year course equivalents in the programme: 23

### 9) Minor Programme

Any student in an honours programme may qualify for a minor in Political Science by completing the equivalent of 5 year courses in Political Science before graduation with a cumulative average of 65 (C) 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 one year course above the 200 level.

Students interested in a minor in Political Science are advised to consult with the Department's Undergraduate Officer. In addition, it is now possible for students in co-op studies in Arts, Mathematics, Science, Engineering, or Recreation to add a wide range of Political Science courses to their programmes.

#### Note

No student in a general, honours, joint honours or minor programme in Political Science may use PSci 291, 292, or 293 to meet programme requirements.
Graduate Programme
The Department of Political Science offers a programme leading to the degree of Master of Arts. The programme consists of the equivalent of two year courses and a thesis, or the equivalent of three year courses and a cognate essay, or four year course equivalents. Highly personalized, flexible instruction is also offered in the form of reading courses. For more information, please consult the Graduate Calendar or the Political Science Department.

Psychology

General Programme
Students choosing a three-year programme in Psychology must complete thirty term courses of which 10 must be in Psychology including:
Psych 101, 102
Psych 200
at least one of Psych 203, 206, 207, 261, 271
at least one of Psych 211, 253, 355, 357
at least one of Psych 212, 331, 333, 334, 335
plus four additional term courses in Psychology

Honours Programme
Students choosing the Honours programme in Psychology must complete, before graduation, the equivalent of 18 term courses in Psychology. Before entering the fourth year of the programme, all students must complete Psych 201, 202, 301 and one course from each of the following groups:
Group 1: 293, 295, 297
Group 2: 393, 395, 397

In the fourth year, all students must complete Psychology 498 or 499. A recommended programme is outlined below.

Recommended Programme

Year 1
Psych 101/102
The equivalent of 8 additional term courses

Year 2
Psych 201/202
The equivalent of two additional term courses in Psychology (see note 1)
The equivalent of six additional term courses

Year 3
Psych 301
The equivalent of five additional term courses in Psychology (see note 1)
The equivalent of four additional term courses

Year 4
Psych 498 or 499
The equivalent of four additional term courses in Psychology (see note 2)
The equivalent of four additional term courses

Note 1
Honours students are required to complete one course from each of the following groups before entering the fourth year of the programme.
Group 1: 293, 295, 297
Group 2: 393, 395, 397

Note 2
It is recommended that honours students include at least two fourth-year seminars in their programme.

Honours Psychology (Applied Studies Co-op)
A student may combine an Honours Psychology programme with Applied Studies Co-op. The requirements in Psychology are identical to the Honours requirements listed above. The Applied Studies requirements are listed on page 88.

Honours Psychology Cooperative Programme
The Department of Psychology offers a Cooperative Honours Programme in Psychology, in which academic studies are combined with relevant work experience. Generally, students are placed as research assistants or administrative assistants in such work settings as government and private research organizations, personnel departments, management training programmes, correctional institutions, and other educational and/or treatment institutions.

The co-op programme consists of six academic terms beyond the first year and four paid work terms. Each work term is of four months duration. 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 Programme 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 programmes.
Honours Psychology with Early Childhood Education and Care Option

Students choosing the Honours Psychology Programme with Early Childhood Education and Care Option must be accepted into the option at the beginning of the third year and must have completed the following courses prior to the fourth year: Psych 101, 201, 202, 203 or 207, 211, 212, 293 or 295, 301, 311, 312, 322, 323, 341, 393, and Health 140. In the fourth year students must complete Psych 422, 423, 453, 498 or 499, Dance 364 and Soc 216. Before graduation each student must complete a minimum of forty-two term courses. Of these forty-two courses a minimum of twenty term courses must be in Psychology with letter grades (Psych 323 and 423 are offered on a pass-fail basis only).

At the end of this programme the student 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.

Recommended Programme

Year 1
Psych 101/102
The equivalent of 8 additional term courses

Year 2
Psych 211, 203 or 207, 212, 312, 201, 202
Health Studies 140
The equivalent of 3 additional term courses

Year 3
Psych 301, 311, 341, 322, 323, 393, 293 or 295
The equivalent of 3 additional term courses

Year 4
Psych 422, 423, 498 or 499, 453, Dance 364, Soc 216
The equivalent of 3 additional term courses

Psychology Joint Honours Programmes

Students choosing a Joint Honours Programme involving Psychology must complete the equivalent of fourteen term courses in Psychology and an Honours thesis course. Unless other arrangements are approved by the Department, all students in Joint Honours Programmes must complete the following courses before entering the fourth year.

Psych 201, 202, 301 and one course from each of the following groups:

Group 1: 293, 295, 297
Group 2: 393, 395, 397

In the fourth year, all students must complete Psych 496 or 499, or the Honours Thesis course in the related discipline.

Joint Honours programmes other than those already approved may be arranged by consultation with the Psychology Department and the Department concerned.

Approved joint honours programme presently exist with Anthropology, Classical Studies, Drama, Economics, English, French, Geography, German, History, Man-Environment, Mathematics, Philosophy, Political Science, Religious Studies, Russian, Social Development Studies, Sociology, Spanish, and Statistics.

Honours Psychology with a BSc Degree

An Honours Psychology degree programme is also available in the Faculty of Science. See Chapter 14.

Minor Programme

Students choosing a Minor programme in Psychology must complete 10 term courses in Psychology including:

Psych 101, 102
Psych 200
at least one of Psych 203, 206, 207, 261, 271
at least one of Psych 211, 253, 355, 357
at least one of Psych 212, 331, 333, 334, 335
plus four additional term courses in Psychology

Religious Studies

Purpose of the Programme in Religious Studies.

a) to expose the student 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 him 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 him to the distinctive features of one or more religious traditions and to the methods for their systematic study.
The course offerings of the Religious Studies Department fall into the following five areas:

1) World Religions
2) History of the Christian tradition
3) Biblical studies
4) Theology - Philosophy - Ethics
5) Religion, Society and Culture.

**Note:**
Areas of Religious Studies to which courses belong are indicated by the number below the course description.

The following programmes are available in Religious Studies.

**A) General degree in Religious Studies**

**Requirements:**
Successful completion (85% average) of a minimum of 5 year course equivalents in Religious Studies including:

a) one year course equivalent from the Religious Studies 100A-K sequence
b) Religious Studies 200 (term course - half credit)
c) one term course from four of the five Religious Studies areas, above the 100 level.
d) one and one-half year course equivalents of electives of which at least one year course equivalent must be at or above the 200 level.

Total number of year course equivalents for the degree, **fifteen.**

**B) Four-Year General degree in Religious Studies**

**Requirements:**
Successful completion (65% average) of a minimum of 7 year course equivalents in Religious Studies, including: a), b), and c) as in the General degree above and
d) three and one half year course equivalents of electives of which two year course equivalents must be at or above the 200 level.

Total number of year course equivalents for the degree, **twenty.**

**C) Honours BA Minor in Religious Studies**

**Requirements:** same as General degree in Religious Studies (A)

**D) Honours Degree in Religious Studies**

**Requirements:**
Successful completion (75% average) of a minimum of 10 RS year course equivalents (credits), including:

1) in particular:
   a) two term courses (1 credit) from the RS 100A-K sequence,
   b) RS 200 (1/2 credit),
   c) RS 490 (1 credit).
2) in general,
   a) one term course from each of the five RS areas,
   b) at least two and a half credits from the courses (not including RS 490) at or above the 300 level.

Total number of year course equivalents (or credits) for the degree, **twenty.**

**E) Honours Religious Studies (Applied Studies Co-op)**

A student may combine an Honours Religious Studies programme with Applied Studies Co-op. The requirements in Religious Studies are identical to the Honours requirements listed above. The Applied Studies requirements are listed on page 68.

**F) Joint Honours Programme in Religious Studies**

The Religious Studies Department offers Joint Honours Programmes with the following Departments: Classical Studies, English, Fine Arts, Germanic and Slavic, History, Man-Environment Studies, Philosophy, Psychology, Social Development Studies and Sociology. The Total number of year course equivalents for the degree, **twenty-two.**

The requirements in Joint Honours Programmes are the same as the Honours Programme, except the overall number of Religious Studies courses is 7, instead of 10 year course equivalents. 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.

**Note:**
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 programmes in Russian and Slavic Studies:

Honours Programme in Russian
Honours Programme in Slavic Studies
Joint Honours Programme in Russian
General Programme in Russian
Minor Programme in Russian
Russian and German/Scientific Translation Programme

Honours Russian
Eligibility for graduation in the Honours Russian Programme includes fulfilment of the following requirements:
1) Successful completion of a minimum of 20 year course equivalents, of which at least 10 year course equivalents must be in Russian.
2) An overall cumulative average of 60% and a cumulative average of 75% in the Russian courses.
3) Completion of the Faculty of Arts Group Requirements.

Honours Slavic Studies
Eligibility for graduation in the Honours Slavic Studies Programme includes fulfilment of the following requirements:
1) Successful completion of a minimum of 20 year course equivalents, of which at least 10 year course equivalents must be in Slavic Studies. Of these 10 year course equivalents, 6 will normally be in Russian and 4 in Ukrainian and Polish.
2) An overall cumulative average of 60% and a cumulative average of 75% in the Slavic courses.
3) Completion of Faculty of Arts Group Requirements.

Honours Slavic Studies (Applied Studies Co-op)
A student may combine an Honours Slavic Studies programme with Applied Studies Co-op. The requirements in Slavic Studies are identical to the Honours requirements listed above. The Applied Studies requirements are listed on page 88.

Russian Joint Honours Programmes
Eligibility for graduation in a Russian Joint Honours Programme includes fulfilment of the following requirements:
1) Successful completion of a minimum of 22 year course equivalents, of which at least 8 year course equivalents must be in Russian.
2) An overall cumulative average of 60% and a cumulative average of 75% in each of the two Honours disciplines.
3) Completion of Faculty of Arts Group Requirements.

A Joint Honours Programme in Russian may be taken in combination with any other discipline in which an Honours Programme is offered, subject to approval by the Departments concerned. Some representative Joint Honours Programmes are:

Russian and Drama
Russian and Economics
Russian and English
Russian and French
Russian and German
Russian and History
Russian and Mathematics
Russian and Political Science

General Programme in Russian
Eligibility for graduation in the General Programme in Russian includes fulfilment of the following requirements:
1) Successful completion of a minimum of 15 year course equivalents, of which at least 6 year course equivalents must be in Russian.
2) An overall cumulative average of 60% and a cumulative average of 65% in the Russian courses.
3) Completion of Faculty of Arts Group Requirements.

Minor Programme 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 5 year course equivalents in Russian with an overall cumulative average of at least 65% in those courses, of which:

a) not more than 2 year course equivalents may be chosen from courses on the 100 level, and
b) at least one year course equivalent must be chosen from courses above the 200 level.
Russian and German/Scientific Translation Programme

Russian and German/Scientific Translation is a four-year General Programme designed for students who wish to specialize in the field of translation of scholarly texts in the arts and sciences. Eligibility for graduation in this programme includes fulfilment of the following requirements:

1) Successful completion of a minimum of 20 year course equivalents, of which
   a) 7 year course equivalents must be approved courses in Russian
   b) 4 year course equivalents must be approved courses in German
   c) 6 year course equivalents must be in the sciences and/or mathematics.

2) An overall cumulative average of 60% and a cumulative average of 65% in the primary and secondary languages.

3) Completion of the Faculty of Arts Group Requirements.

Social Development Studies

Social Development Studies are integrated multidisciplinary programmes providing a liberal education with concentration in certain pure and applied social sciences. The inter-related courses of the programmes 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. As part of the programmes the College offers its own courses in Interdisciplinary Social Science, Psychology, Social Work and Sociology. Students select other courses from the departments of the University or the other colleges to serve particular needs and interests. In the programmes particular attention is given to the development of human personality in the context of the major social institutions and our major 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 the 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.

These programmes stand as a sound liberal and general education. However, they also provide an excellent background for further study in professions such as Social Work, education, religion, the Ministry, Law or Journalism, and for work in various helping professions, community organizations, communications and international service organizations.

The General Programme

The general programme normally extends over six academic terms (usually three years) of full-time study but may also be completed by part-time students. Courses are available in both day and evening periods. Students registered in the programme must complete:

1) The equivalent of 30 term courses in total with an overall average of at least 60%;
2) The normal Group A and B requirements of the Faculty of Arts;
3) The equivalent of at least 14 term courses from the core area courses listed below with the following stipulations:
   a) In the first year a student must register in the fall term for Social Work 120R, Psychology 120R and Interdisciplinary Social Science 150R. In the winter term which follows, the student must register in Soc 120R, ISS 131R and Psych 121R. In the second year all students are required to take a full credit in social research (i.e., ISS 250R/251R). A student is required to complete a minimum of 4 term course equivalents from the list in each year of registration in the three-year programme.
   b) The 14 term course equivalents must be distributed over at least 3 of the 4 core areas with a maximum of 6 term course equivalents within a single area counting towards the requirement.
4) After meeting these minimum requirements, the student may elect his/her remaining courses from the general arts offerings of Renison or any Department of the University.
5) Transfer students from other programmes, faculties or universities must comply with all requirements as set out above. In special cases they may petition for equivalent credit for courses taken elsewhere which are similar to core area courses. Petitions should be directed in writing to the Registrar of the College.
6) For further information consult the Registrar, Renison College, Waterloo, Ontario N2L 3G4.
Core Area Courses

<table>
<thead>
<tr>
<th>Interdisciplinary Social Science</th>
<th>Social Work</th>
<th>Sociology</th>
<th>Psychology</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISS 131R</td>
<td>Socwk</td>
<td>Soc 120R</td>
<td>Psych 120R</td>
</tr>
<tr>
<td>ISS 150R</td>
<td>120R</td>
<td>Soc 121R</td>
<td>Psych 121R</td>
</tr>
<tr>
<td></td>
<td>Socwk</td>
<td>121R</td>
<td></td>
</tr>
<tr>
<td>ISS 220R</td>
<td>Socwk</td>
<td>Soc 220R</td>
<td>Psych</td>
</tr>
<tr>
<td>ISS 221R</td>
<td>220R</td>
<td>Soc 221R</td>
<td>220R</td>
</tr>
<tr>
<td>ISS 231R</td>
<td>Socwk</td>
<td>Soc 225R</td>
<td>Psych</td>
</tr>
<tr>
<td>ISS 250R</td>
<td>221R</td>
<td>Soc 226R</td>
<td>221R</td>
</tr>
<tr>
<td>ISS 251R</td>
<td>Socwk</td>
<td>222R</td>
<td></td>
</tr>
<tr>
<td>ISS 320R</td>
<td>Socwk</td>
<td>Soc 325R/</td>
<td>Psych</td>
</tr>
<tr>
<td>ISS 343R</td>
<td>320R</td>
<td>326R</td>
<td>322R</td>
</tr>
<tr>
<td>ISS 350 (a-f)</td>
<td>Socwk</td>
<td>Soc 327R/</td>
<td>Psych</td>
</tr>
<tr>
<td>ISS-398R</td>
<td>321R</td>
<td>328R</td>
<td>323R</td>
</tr>
<tr>
<td>399R</td>
<td>Socwk</td>
<td>Soc 307R/</td>
<td>Psych</td>
</tr>
<tr>
<td>ISS 469R</td>
<td>326R</td>
<td>399R</td>
<td>367R-369R</td>
</tr>
<tr>
<td>ISS 499R</td>
<td>350 (a-f)</td>
<td>Socwk</td>
<td>398R/399R</td>
</tr>
<tr>
<td></td>
<td>355R</td>
<td>Socwk</td>
<td></td>
</tr>
<tr>
<td></td>
<td>365R/366R</td>
<td>Socwk</td>
<td></td>
</tr>
</tbody>
</table>
| The Social Work Stream

Within the programme of studies for the Bachelor of Arts degree with a Major in Social Development Studies, 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. It is recommended that the courses taken to satisfy programme requirements in this stream include Psych 322R, Psych 323R, Soc Wk 220R, ISS 231R, and Soc Wk 221R or 222R.

Diploma in Social Work

Students following the Social Work Stream within the Social Development Studies programme may additionally apply at the end of Year 1 for admission to the Diploma in Social Work awarded by the College. To quality for the diploma, students must successfully complete 200 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.

The Honours Programme

The honours programme normally extends over eight academic terms (usually four years) of full-time study.

Requirements for the honours programme are:

1) a minimum of 42 term course equivalents in total while maintaining an overall average of at least 60% and a cumulative average of 75% in the core area courses of the programme;
2) the normal “Group A and B” requirements of the Faculty of Arts, University of Waterloo;
3) a minimum of 18 term course equivalents within the core areas of the programme;
4) a minimum of 8 term course equivalents related to one of the multidisciplinary theme areas. (see note 1)

Year 1

Fall: ISS 150R, Psych 120R, Soc Wk 120R
Winter: Soc 120R, Psych 121R, ISS 131R.
The equivalent of 4 additional term courses.

Year 2

ISS 250R/251R
At least two term courses from among:
ISS 220R, 221R, 231R
Soc Wk 220R, 221R, 222R
Soc 220R, 221R, 102(R)
The equivalent of 4 term courses from chosen theme areas
The equivalent of 3 additional term courses.

Year 3

ISS 320R, Soc W 326R
At least two term courses from among:
Psych 322R, 323R, 334 (R), 369R
The equivalent of 4 term courses from chosen theme area
The equivalent of 3 additional term courses.

Year 4

ISS 469R, 499R
The equivalent of 6 additional term courses.
Students in the Honours Social Development Studies Programme are required to complete the equivalent of 8 term courses from a theme area of study which has been selected in consideration of the students' own needs and plans. The suggested theme areas are: "Home and School", "Work", "Community", "Mental Health".

In consultation with Renison's Undergraduate Officer, courses are chosen in such a manner as to explore the theme area in depth, looking at the historical, institutional, and cross-cultural aspects, and examining value systems and patterns of change.

Social Development Studies Joint Honours Programme
Social Development Studies Requirements
1) Four introductory term courses from the following: ISS 131R, ISS 150R, Psych 120R, Soc 120R, Soc Wk 120R;
2) Methodology: ISS 250R/251R;
3) ISS 320R, plus 5 term course equivalents at the 200 level or above;
4) A Senior Seminar, ISS 469, or a Senior Honours Essay, ISS 499R.

Note: The student will be expected to develop an elective theme area of 8 term course equivalents. There are joint honours programmes with Religious Studies, Psychology and Philosophy.

The requirements for the joint honours programme with Psychology vary in that Psych 101 and Psych 102 may be substituted for Psych 120R and Psych 121R; ISS 250R for Psych 201; ISS 251R for one of Psych 393, 395 or 397. In 4th year ISS 469R is required plus one of ISS 499R, Psych 498 or Psych 499.

Minor Programme
A minor in Social Development Studies consists of 10 term course equivalents taken from among the courses approved for the programme. 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) 7 term course equivalents beyond the first year level including at least 2 term course equivalents in each of two different disciplines.

Of the 10 term course equivalents for the minor, no more than six may be taken in any one discipline.

Note:
For students 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.

Sociology

General Sociology
Students who take the three year general programme with a major in Sociology must successfully complete the following ten term courses in Sociology:

A term course introduction to Sociology (Soc 101)
A term course in sociological methods (one of Soc 281, 380, 381)
A term course in sociological theory (one of Soc 271, 405, 406)
At least seven additional term courses in Sociology

Students are strongly encouraged to elect Sociology 280, Social Statistics and Social Indicators, although this is not required.

Honours Sociology

Recommended Programmes

Year 1
Soc 101
One other term course in Sociology
Eight term course equivalent electives

Year 2
Soc 280
Four term courses in Sociology
Five term course equivalent electives

Year 3
Soc 281/282
Four term courses in Sociology
Four term course equivalent electives

Year 4
Soc 405/406
Soc 499
Two term courses in Sociology
Six term course equivalent electives
**Note**

Students may elect Honours Sociology (Canadian Studies) or Honours Sociology (Peace and Conflict Studies) by fulfilling the Honours requirements in Sociology and the requirements listed under Canadian Studies or Peace and Conflict Studies in this Calendar.

**Honours Sociology-Co-operative Programme**

The Department of Sociology is a participating Department in the Co-operative Programme in the Behavioural Sciences. This is an Honours programme 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 programme 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 programme with Applied Studies Co-op. The requirements in Sociology are identical to the Honours requirements listed above. The Applied Studies requirements are listed on page 88.

**Sociology Joint Honours Programmes**

Sociology has joint honours programmes with the following:

- Anthropology, Economics, English, French, Geography, History, Philosophy, Political Science, Psychology, Spanish, Mathematics and Recreation.

The usual recommended programme in Sociology for joint honours is fifteen term course equivalents distributed as follows: a term course in introductory Sociology (101); a term course in statistics (280); two term courses in research methods (281/282); two term courses in sociological theory to be chosen from 271, 405, 406; the equivalent of seven term courses of electives in Sociology; and an honours thesis course (499) or the equivalent in the related department.

**Note 1**

For requirements in joint honours with History, Philosophy, Psychology and Mathematics, see the Department Undergraduate Officer.

**Note 2**

In the joint honours programme with French, Soc 280 may be replaced by an elective in Sociology.

**Minor Programme**

Students electing a minor programme in Sociology must complete 10 term courses in Sociology with a minimum 65% average for all Sociology courses.

The required courses in Sociology for the general programme in Sociology are also required from students choosing the minor programme.

---

**Spanish**

*(Jointly mounted with Wilfrid Laurier University)*

**Note:**

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. Please check with Undergraduate Officer in Spanish and note cross-registration procedures on pg. 17 of the Calendar.

**General Spanish**

Students in the three year General Programme must complete 10 term course equivalents in Spanish beyond the introductory level, of which 6 term course equivalents are language and two term courses are Survey of Spanish Literature.

**Honours Spanish**

Students in the Honours Programme must complete twenty term course equivalents in Spanish, of which at least six term courses are language, two term courses are Survey of Spanish Literature, one term course is Golden Age, and one term course is Spanish American Literature.

**Recommended Programme**

**Year 1**

Span 201A/201B. (Students with little or no Spanish will take Span 101/102 in the first year and Span 201A/201B in the second year.)

Eight additional term course equivalents

**Year 2**

A minimum of six term courses in Spanish, including Span 251A/251B, 205/206, or 201A/201B.

Four additional term course equivalents

**Year 3**

A Minimum of six term courses in Spanish, including Span 351A/351B, 326 or 327, or 251A/251B

Four additional term course equivalents

**Year 4**

A minimum of six term courses in Spanish, including one term course in Spanish American Literature

Four additional term course equivalents
Honours Spanish (Applied Studies Co-op)
A student may combine an Honours Spanish programme with Applied Studies Co-op. The requirements in Spanish are identical to the Honours requirements listed above. The Applied Studies requirements are listed on page 88.

Spanish Joint Honours
The Department of Spanish recognizes combined Honours Programmes in Spanish and the following disciplines:
Classical Studies
English
French
German
History
Latin
Sociology

Other combinations may be arranged by consultation between the student and the Departments concerned.

Students in the Spanish Joint Honours Programme must complete sixteen term course equivalents in Spanish, of which at least six term courses are language, two term courses are Survey of Spanish Literature, one term course is Golden Age, and one term course is Spanish American Literature.

Recommended Programme

Year 1
Span 201A/201B. (Students with little or no Spanish will take Span 101/102 in the first year and Span 201A/201B in the second year.)
Eight additional term course equivalents

Year 2
A minimum of four term courses in Span 251A/251B, 205/206, or 201A/201B.
Six additional term course equivalents

Year 3
A minimum of six term courses in Spanish, including 351A/351B, 326 or 327, or 251A/251B
Six additional term course equivalents

Year 4
A minimum of four term courses in Spanish, including one term course in Spanish American Literature
Six additional term course equivalents

Notes for Honours and Joint Honours Spanish

Note 1
Before graduation students must complete the requirements of their home university and faculty.

Note 2
For Honours Spanish, a minimum of 40 term course equivalents must be successfully completed before graduation, of which 20 term course equivalents must be in Spanish.
For Joint Honours, a minimum of 44 term course equivalents, of which 16 term course equivalents must be in Spanish.

Note 3
With the permission of the Department, students may spend the third year enrolled in an acceptable university in Spain or in Spanish America.

Note 4
Students in Years 3 and 4 must have the permission of the home Department to enrol in Spanish courses on the lower levels.

Minor in Spanish
Students in an Honours Programme interested in Spanish as a complement to the major field of study will be expected to complete ten term course equivalents in Spanish. Please consult the Undergraduate Officer in Spanish for Minor in Spanish.
Studies in Personality and Religion

Studies in Personality and Religion (SIPAR) is an inter-disciplinary programme 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 processes of religious growth and development. The SIPAR option is also appropriate for those considering careers in the ministry or other service oriented vocations. The programme is administered by St. Paul's College, in co-operation with an advisory committee representing four departments in the University of Waterloo. The participating departments presently include Philosophy, Psychology, Religious Studies and Sociology.

The Core Course Curriculum
The core course curriculum provides an introduction to the field of Studies in Personality and Religion. The goals of the core course programme are to give the student a base of knowledge, a familiarity with the subject and an understanding of the concepts involved.

There are four half courses in the core programme: Psychology of Religion in Historical Perspective (Arts 202P) provides an historical survey of 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.

Programme Options
There are two different options open to students participating in the SIPAR programme. The first is open to students in a general programme; the second, to students in an honours programme only.

1) General Programme
A SIPAR option consisting of 6 term courses may be earned by students in a General programme. 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 course equivalents 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.

For details of core courses and content courses, please consult Course Descriptions section of this calendar.

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.
Canadian Studies Programme

Campus scene
The Option in Canadian Studies

The Canadian Studies option allows students to gain a broad insight into the nature of Canadian culture and society in three areas. Students take courses about Canada in their selected discipline. They take courses about Canada in other departments outside of their discipline, and take core, interdisciplinary courses offered by the Canadian Studies Programme Centre at St. Paul’s United College.

The General and Honours Option in Canadian Studies

Students in Anthropology, Economics, English, French, Geography, History, Political Science, Sociology, or Urban and Regional Planning who have a particular interest in the study of Canada should consider taking either a General or an Honours option in Canadian Studies.

Year I
At Waterloo, students declare their area of study in the second year and therefore there are no Canadian Studies requirements in the first year. However, it is recommended that students who intend to take the Canadian Studies option, take a course in French language in the first year. Otherwise, students should proceed with the usual first year programme set out by their Faculty.

Once students have declared their home discipline among one of the nine listed above, then they can also choose the option in Canadian Studies. Those taking a three-year General degree can do the General option in Canadian Studies. Those taking the Honours degree should declare an Honours option in Canadian Studies. Both options are identical except that Honours students do the fourth year.

Year II
Canadian Studies 201/202 given at the Canadian Studies Programme Centre at St. Paul’s College.
One full or two half-courses in your home discipline chosen from courses dealing specifically with Canada.
One full or two half-courses chosen from outside your discipline. These courses deal specifically with Canada and are to be selected from the list of approved courses provided in the Canadian Studies section of Chapter 15 of the Calendar.
The equivalent of two full courses chosen to meet your Honours requirements in your home discipline.

Note 1 It is possible to do a double Honours Programme and also take the Canadian Studies option. In this case, students take a full course or two half-courses in each of the Honours areas and take the core Canadian Studies courses. They do not need to take the courses listed outside of their Honours areas in other departments.

Year III
Canadian Studies 301/302 given at the Canadian Studies Programme Centre at St. Paul’s College.
One full or two half-courses in your home discipline chosen from courses dealing specifically with Canada.
One full or two half-courses chosen from outside your discipline. These courses deal specifically with Canada and are to be selected from the list of approved courses provided in the Canadian Studies section of Chapter 15 of the Calendar.

General degree students will graduate at the end of this third year with a degree in their home discipline with the Canadian Studies option shown on their diploma.

Year IV
Canadian Studies 400 given at the Canadian Studies Programme Centre at St. Paul’s College.
One full or two half-courses in your home discipline chosen from courses dealing specifically with Canada.
One full or two half-courses chosen from outside your discipline. These courses deal specifically with Canada and are to be selected from the list of approved courses provided in the Canadian Studies section of Chapter 15 of the Calendar.
The equivalent of two full courses chosen to meet your Honours requirements in your home discipline.

The Minor in Canadian Studies

Any Honours student may do a minor in Canadian Studies regardless of his/her faculty or department. To do so, he/she must put together a package equivalent of five full courses. The student takes the Canadian Studies core courses, 201/202 and 301/302. The student also takes the equivalent of three full courses from the approved list of courses listed in the Canadian Studies section of Chapter 15.
Faculty of Engineering

Systems Design Engineering
The Co-operative Engineering Programme

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 programme 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 programme 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 programme is common for all programmes except Chemical and Systems Design Engineering. A substantial part of the work of the first and second years is common to all programmes. Starting with the second year (first year for Chemical and Systems Design Engineering) students elect one of the five principal divisions of engineering. The curriculum for each of the five basic programmes combines required "core" subjects essential to the field, and "elective" subjects permitting considerable diversity in individual programmes 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 programme is given in Chapter 5, as well as specific requirements as noted under the examinations and promotions section of this chapter.

Degrees
The Degree of Bachelor of Applied Science (BASc) is awarded by the University in the following undergraduate programmes:

- Chemical Engineering
- Civil Engineering
- Electrical Engineering
- Mechanical Engineering
- Systems Design Engineering

All programmes entail 4-2/3 calendar years of undergraduate study on the co-operative system.

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 1 students enrol in September. These Year 1 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 programme and graduate together. Both groups, of course, have the same total time on campus and in industry, one group having a double academic term at the start of the programme and the other having a double academic term at the end of the programme. Precise dates for the beginning and end of the various terms are shown in the academic calendar on pages 5-8.

The programme in Systems Design Engineering is not divided into two groups. All students in this programme start with four months of school before going out on the first work term in the Winter.

The admission requirements and procedures for all programmes 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 Grade 13
Applicants must present 6 credits; five of those must be: Relations and Functions, Calculus, Algebra, as well as Chemistry and Physics in their overall Grade 13 programme. Applicants with high overall standing who are missing one or two of the five specific Grade 13 requirements must contact the Admissions Officer no later than January (for September admission). Applicants will be evaluated and advised on possible courses of action required to meet our specific requirements.

Admission as an Adult Student
It is recommended that applicants attempt to obtain standing in Ontario Grade 13 Mathematics and Science courses 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 programme, no student will be admitted above Year 3, term A level. Any student thus admitted will be required to register in the January term and to complete a minimum of three satisfactory work terms. 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

Note
The Faculty of Engineering has revised its examinations and promotions procedures and the following regulations went into effect beginning with those students entering Year 1 Engineering in the Fall 1978 term. Students who entered the Engineering programme prior to September 1978 will be governed by the regulations as laid out in the 1977-78 calendar.

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 the work for that course. 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 effects on the student's progress in the programme are as follows:

- Promoted - proceed to next term
- Promoted (Aegrotat) - proceed to next term
- *Proceed on Probation - proceed to next term
- Required to Repeat Term - No Penalty - may repeat in next available term
- **Required to Repeat Term - must stay out 2 terms before repeating

Voluntary Withdrawal - re-admission possible only through letter of application to Admissions Committee at any time after the term in which the student withdraws

Must Withdraw from Engineering - re-admission possible only through application to Admissions Committee after at least 3 terms out and with new evidence of ability to succeed in programme

Decision Deferred - may not proceed until status cleared

Recommended for BASc Degree at (Spring/Fall) Convocation - (First/Second/Third) Class Honours
- programme successfully completed

*Not used in final term
**Not used in 1A

The procedures through which promotion decisions are made are as follows:

At the end of each term, examining faculty members submit grades for that term's courses. Each department then reviews the performance of students registered in that department and makes promotion recommendations to the Examinations and Promotions Committee. The Engineering Examinations and Promotions Committee considers the evidence on which the departments have based their promotions 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 students through the Registrar's Office. All recommendations to award degrees must be approved by Senate.

The rules which are applied when the student's performance is assessed are as follows:

1) To continue in the degree programme, a student must have a term average of 50% or better. Except in 1A, a student receiving an average below 50% who has never before in the programme 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.

2) Excluding terms when a student is allowed to repeat without penalty, the programme must be completed in no more than ten academic terms (i.e. no more than two repeated terms) and no term may be repeated more than once.

3) To be unconditionally promoted in the programme a student must have a term average of 60% or better and fewer than two grades below 50.

4) A student with a term average of over 60% and two or more course grades below 50 will normally be allowed to proceed on probation. Probationary status will be cleared by achieving an unconditional promotion at the end of the probationary term. A student on probation who receives an average over 60% and two or more course grades below 50 will be required to repeat the term.

5) A student with a term average of 50 - 59% will be required to repeat the term except in 1A when the student will be allowed to proceed on probation.
6) A student on a repeat term who does not achieve an unconditional promotion will be required to withdraw from the programme.

7) A student may withdraw voluntarily from the programme at any time prior to four weeks before the commencement of the final exam period in the term by giving written notification of the withdrawal. Students in 1A may withdraw at any time in that term.

8) A student may be required to withdraw from the programme at any time if, in the opinion of the Faculty, the student is unlikely to benefit from further participation in the programme or if the student leaves the programme without notification and fails to write examinations.

9) Students who have successfully met all the requirements of the programme and have been recommended for a BASc degree will have First, Second or Third Class Honours standing designated according to the cumulative 3A - 4B average.

10) 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.

11) 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 on letter of permission, however, will be reported on a student’s transcript. Normally students will be expected to register for the minimum number of courses specified by the calendar for the appropriate term.

12) There are no supplemental examinations except in the last term of the programme. A minimum grade is not normally required in any one subject, although individual departments may designate minimum grade requirements in certain courses. Also, there are individual department rules regarding the grading and averaging of non-technical elective courses.

13) Students who are required to repeat a term will normally be required to repeat all of the work of the failed term. Where timetables permit, repeating students may be excused from repeating individual courses in which good marks have been obtained and permitted to register in other appropriate courses, at the discretion of the student’s department.

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 - 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 six months have elapsed since the end of the term, a grade must be submitted.

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 purposes of reporting and averaging according to the following table:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Letter</th>
</tr>
</thead>
<tbody>
<tr>
<td>A+95</td>
<td>B+78</td>
</tr>
<tr>
<td>B+68</td>
<td>C+58</td>
</tr>
<tr>
<td>D+58</td>
<td>F+46</td>
</tr>
<tr>
<td>A-89</td>
<td>B-75</td>
</tr>
<tr>
<td>C-65</td>
<td>D-55</td>
</tr>
<tr>
<td>F-32</td>
<td></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 doctor’s certificates and similar supporting 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 within three weeks of receipt of the mark report. Appeals being launched later than six months after the end of the term being appealed will not be considered.

16) Changes to a student’s original registration form may be permitted at the discretion of a student’s department. All such arrangements must be indicated and approved before the end of the normal “Drop/Add” Period, which is a period of three weeks at the beginning of each term. After the end of the three week period, only exceptional cases for change will be considered.

17) Students must demonstrate consistent satisfactory performance during their work-term employment. They must also submit the required number of acceptable work term reports (See booklet on Regulations and Procedures for Co-operative Programmes).
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 four 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 3 work terms remaining, only 3 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 re-written 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 on Regulation & Procedures for co-operative programmes).

The General Studies Programme in Engineering
The Canadian Accreditation Board of the Canadian Council of Professional Engineers has recommended the inclusion of "...a minimum of one-half year of appropriate humanities and social sciences" in Canadian Engineering curricula as a basis for the accreditation of a degree programme. The Engineering Faculty Council and the Senate of the University approved the underlying principles of a "General Studies Programme" as a response to that requirement.

"General Studies", as an integral component of Engineering education at Waterloo, is intended to provide some understanding of the wider humanistic and societal context within which an Engineering career must grow and interact.

Students in the Faculty of Engineering, beginning with the class entering in Fall, 1977, must complete, as a part of the BASc requirements, a programme consisting of five courses in humanities and social sciences, to be selected from course lists published by the Faculty, such that at least two of the courses are advanced level courses in the same, or closely related, subject area.

The course lists, published each year, will be divided into: List A - introductory, no-prerequisite courses; List B (Options) - recommended sequences in a range of coherent options, containing at least two advanced level courses; List B (Other Courses) - other advanced level courses from among which students may devise their own appropriate sequence. Any choices other than those from the published lists require the approval of the student's departmental advisor.

Combined Bachelor's - Master's Programme in Engineering

1. INTRODUCTION
The Faculty of Engineering programme offers a combined Bachelor's-Masters' Programme. The programme 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 programme.

This programme 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 programme.

II. GENERAL PRINCIPLES OF COMBINED BACHELOR'S-MASTER'S PROGRAMMES
A combined Bachelor’s-Master’s programme is one in which it is deemed academically advantageous to treat the educational process leading through the BASc to the MASc degree as a single continuous integrated whole, while at the same time satisfying the requirements for both degrees. This stands in contradistinction to treatment of the Bachelor's and
Master's degree programmes each as terminal activities. Such structured programmes, starting at the undergraduate level and terminating with MASc degree in the Faculty of Engineering provide an alternative means, complementary to the existing undergraduate and graduate programmes, for the attainment of the MASc degree.

The following are some general conditions that all such combined Bachelor's-Master's degree programmes should satisfy:

A) Students who elect to enter and pursue the combined Bachelor's-Master's programmes will fulfill the degree requirements of both the BASc programme and the MASc programme. 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 programme 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 programme must be met.

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

C) Admission to the combined programme is on the basis of merit, as is continuance in the programme. Students who fail to maintain sufficiently high standing will be required to revert to the regular programme, or even if circumstances so warrant, to withdraw from the University.

D) The culmination of the combined programme 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 programme normally functions on the co-operative basis.

F) Recruitment into a combined Bachelor's-Master's degree programme must have the flexibility to satisfy the requirements of individual students; at the same time it must have coherence—each student's programme must be addressed toward a well-defined area of specialization.

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

A) Application and Admission
Admission to the combined Bachelor's-Master's degree programme 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 programme". 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 programme 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 Programmes
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 (two 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 an MASc with a Master's degree project, would normally select three 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 programme 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 programme 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 terms. The programme, 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 programme may apply for NSERC, OGS, CMHC scholarships, etc. at the same time as their colleagues in the regular programmes. 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 programme 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 programme. 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 programme and marks therefrom included in the 4A and 4B averages as appropriate. Should the student have then satisfied the requirements for the BASc degree, it will be granted at the next Convocation. Such a student will not be permitted to enter the regular MASc programme. If a student does maintain at least the minimum standard mentioned above, but decides to withdraw voluntarily from the combined Bachelor's-Master's programme, 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 programme, but the graduate courses taken in the final undergraduate year may not be applied to the Master's degree.

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, 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.

Academic Programmes
The core programmes for each of the five major divisions of engineering provide the foundation for professional activity in any field of engineering interest. In addition a wide variety of elective courses are available from which optional programmes may be developed under the guidance of faculty advisors.

For further enlargement of the programmes, refer to the Faculty chapter in this calendar.

Year 1 Engineering Programmes
All students enrolling in Year 1 are required to choose one of the following three programmes:

a) General Engineering
b) Chemical Engineering
c) Systems Design Engineering
At the completion of the first year, students in the General Engineering programme are required to select one of the following major divisions of engineering for the second year of study.
Civil Engineering
Electrical Engineering
Mechanical Engineering

Students enrolling in General Engineering must register in the courses indicated in the following table: (Course descriptions can be found in chapter 15).

**Term 1A**
Mathematics 110A
Mathematics 114
Ch E 102
Physics 121
Gen E 115

**Term 1B**
Mathematics 110b
Gen E 114
Gen E 121
Gen E 122
One technical option from the following:
Civ E 116
El E 116
ME 116
One General Studies elective to be chosen from the list of recommended course which will be published each year.

Students enrolling in Chemical Engineering register for the same course 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 Gen E 116 in the 1B term.

Students enrolling in Systems Design should refer to page 477 for the Systems Design course listings.

Students in Chemical and Systems Design Engineering may transfer to Civil, Electrical or Mechanical Engineering (see booklet entitled Admissions '81 for conditions of transfer and make-up requirements).

**Note**
Detailed course descriptions commence in Chapter 15. Courses beginning with Gen E (General Engineering) can be found on page 335.

---

**Chemical Engineering**

The basic objective of the undergraduate programme 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, Business, etc. To be most effective in a rapidly changing technological age, the programme 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 his earlier studies. Specialization is available through the following six options.

**Biochemical and Food Engineering**
This option deals with the processing of systems where biochemical phenomena are important. It is concerned with waste treatment, food processing and fermentation operations which manufacture microbial products such as alcoholic beverages, yeasts, antibiotics, vitamins, and enzymes. 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.

**Extractive and Process Metallurgy**
This option 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.

**Pollution Control Engineering**
This option 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.

**Polymer Science and Engineering**
This option 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 percentage of the Ontario chemical industry is directed towards polymers (plastics, elastomers, synthetic fibres).

**Transport Processes**
This option 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 option 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.

Guide to Undergraduate Chemical Engineering Course Numbers

The code for the course numbers is consistent with the graduate course numbers and is as follows:

First digit (1-5) year
1-4: Year of study, core courses
5: Fourth Year, elective courses

Second digit (0-8): subject matter
0: General Engineering
1: Transport Processes
2: Mathematics, Control, Economics
3: Chemistry, Kinetics, Catalysis
4: Polymer Science and Engineering
5: Extractive and Process Metallurgy
6: Biochemical and Food Engineering
7: Ecology, Environmental Engineering
8: Projects, Seminars, etc.

Third digit (0-9): term
Even numbers: A term
Odd numbers: B term

A) Core Courses (Beyond Year 1)
Ch E 210 Transport Processes 1 (Equilibrium Stage Operations)
Ch E 213 Transport Processes 2 (Fluid Mechanics)
Ch E 220 Applied Mathematics 1
Ch E 230 Physical Chemistry 1
Ch E 231 Physical Chemistry 2
Ch E 232 Inorganic Chemistry 1
Ch E 233 Physical Chemistry Laboratory
Chem 026 Organic Chemistry 1
Chem 036 Organic Chemistry 2
Math 210 Calculus 2
Math 216 Differential Equations
Ch E 314 Transport Processes 3 (Heat Transfer)
Ch E 317 Transport Processes 4 (Mass Transfer)
Ch E 320 Applied Mathematics 2
Ch E 321 Process Dynamics and Control 1
Ch E 330 Chemical Engineering Thermodynamics
Ch E 331 Chemical Reaction Engineering
Ch E 332 Inorganic Chemistry 2
Ch E 333 Instrumental Methods of Chemical Analysis
Ch E 382 Engineering Economics and Process Design 1
Ch E 410 Chemical Engineering Laboratory
Ch E 484 Engineering Economics and Process Design 2
Ch E 486 Technical Seminar
Ch E 007 General Awareness Seminar

Note: Students whose registration in first year was prior to September 1979 follow a programme described in the 1980/81 Calendar.

B) Elective Courses
In addition to the core courses listed above, a minimum of 12 elective courses must be taken beyond Year 1. The usual sequence of technical (T) and General Studies (GS) electives is as follows:

<table>
<thead>
<tr>
<th>Term</th>
<th>GS</th>
<th>T</th>
<th>Free (GS or T)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2B</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3A</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3B</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4A</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>4B</td>
<td>0</td>
<td>4*</td>
<td>1</td>
</tr>
</tbody>
</table>

*must include one of Ch E 581 (counts as two courses), Ch E 583, Ch E 585.

Note: One of the 2 free electives in 4th year must normally be a General Studies elective.

Four or five of these courses may be chosen from social sciences, humanities, languages and other non-technical subjects. Four of the courses together with the general studies course in the 1B term must satisfy the General Studies Programme requirements described on page 129.

The remaining seven or eight courses must be technical electives which must include either the seventh option group listed below or one of the first six option groups listed plus one of Ch E 583 or Ch E 585. The other technical electives may be chosen from other Chemical Engineering courses or from other science or engineering courses according to interest, but the choice must be approved by the Associate Chairman (Undergraduate Studies).

The three technical electives for each of the seven Chemical Engineering option groups are identified below. Within each option group, the first course is normally taken in the 3B or 4A term and the other two courses are normally taken in the 4B term.

1) Transport Process
Ch E 510 Prediction of Physico-Chemical Properties
Ch E 515 Two-Phase Flow Operations
Ch E 517 Performance of Separation Processes

2) Mathematical Analysis and Control
Ch E 520 Chemical Engineering Analysis
Ch E 521 Process Dynamics and Control 2
Ch E 523 Process Control Laboratory
3) Polymer Science and Engineering  
Ch E 540 Introduction to Polymer Science  
Ch E 541 Physical Chemistry of Polymers  
Ch E 543 Polymer Laboratory

4) Extractive and Process Metallurgy  
Ch E 550 Introduction to Extractive Metallurgy  
Ch E 551 Metallurgical Chemistry  
Ch E 553 Principles of High Temperature Extractive Metallurgy

5) Biochemical and Food Engineering  
Ch E 560 Introduction to Biochemical Engineering  
Ch E 561 Fermentation Operations  
Ch E 563 Food Processing

6) Pollution Control Engineering  
Ch E 560 Introduction to Biochemical Engineering  
Ch E 570 Air Pollution  
Ch E 571 Water Pollution

7) Research/Design Option  
Ch E 580 Research-Design Project 1  
Ch E 581 Research-Design Project 2  
(worth 2 courses)

Other Research and/or Design Projects  
Ch E 583 Process Systems Design  
Ch E 585 Technical Elective Project

Courses not in any Option Group  
Ch E 501 The Chemical Engineer as an Entrepreneur  
Ch E 502 Fundamentals of Petroleum Production

A student may acquire a BASc in Chemical Engineering with an option in Management Sciences by taking eight specific M Sc courses as electives (see listing under equivalent with M Sci 21 and M Sci 23, respectively).

The six other courses use 6 of the minimum 12 elective course choices (3 GS and 3 T). The student must achieve a grade of at least 50% in each of the 8 courses and must obtain an average of 60% or more in these courses in order to receive recognition for satisfactorily completing the Option.

Academic Programme for Each Term

Note:  
Students whose registration in first year was prior to September 1979 follow a programme described in the 1980/81 Calendar.

Term 2A, Fall and Winter  
Math 210, Chem 026, Ch E 210, Ch E 220, Ch E 230, Ch E 232, Ch E 007

Term 2B, Spring and Fall  
Math 216, Chem 036, Ch E 213, Ch E 231, Ch E 233, Ch E 007, General Studies Elective

Term 3A, Winter and Spring  
Ch E 314, Ch E 320, Ch E 330, Ch E 332, Ch E 382, Ch E 007, General Studies Elective

Term 3B, Fall and Winter  
Ch E 317, Ch E 321, Ch E 331, Ch E 333, Ch E 007, Technical Elective, (Ch E 550 or Ch E 570), General Studies Elective

Term 4A, Spring and Fall  
Ch E 410, Ch E 484, Ch E 486, Ch E 007, 2 Technical Electives, Free Elective.

Term 4B, Winter  
Either: Ch E 581, Ch E 007, 2 Technical electives, Free Elective  
or: Ch E 583, Ch E 007, 3 Technical Electives, Free Elective  
or: Ch E 585, Ch E 007, 3 Technical Electives, Free Elective

Note: One of the 4A and 4B Free Electives must normally be a General Studies Elective, the other may be a Technical or General Studies Elective. General Studies Electives must be chosen from the list of courses approved for this purpose, and published in the Engineering Society Handbook.

All courses indicated above for which numeric grades are received are included in determining the term average and rank in class. Grades for courses in excess of those indicated above are recorded but not included in determining the term average.

Detailed course descriptions are given in Chapter 15.
Civil Engineering

The complex problems and needs of current and future societies have created challenges for Engineering unparalleled in our history. In attempting 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. Certainly within the profession, there has been a growing awareness of the fact that a civil engineer must deal with the human impact of engineering – the social and moral issues – to a far greater degree than ever before.

Historically, Civil Engineering is the oldest branch of engineering and goes back at least five thousand years to the profession of “master builder” which involved pyramids, temples and irrigation projects. Today, Civil Engineering has become an incredibly diverse field of engineering with opportunities for graduates in many fields of application. Furthermore, the introduction of new electronic data collection methods and inexpensive mini-computers have revolutionized many civil engineering fields. Consequently, our curriculum is being constantly monitored and revised in order to graduate engineers who can use these advanced aids to solve complex problems. As is true of all engineering programs, the curriculum not only continues to utilize the fundamentals of mathematics and natural sciences, but also draws upon the works of the social scientist, humanist and social-economist. The emphasis is on “problem-solving”.

The Department of Civil Engineering at Waterloo is the largest in Canada, and therefore we can offer highly specialized programs in each of the following options –

a) Structural Engineering – intended for students primarily interested in design and construction of structures; emphasis is placed on a broad foundation in mechanics and behaviour of materials.

b) Environmental Health Engineering – the major attention in this option is given to studies of water and air resources supply, treatment and disposal, industrial hygiene, radiation protection, control of communicable diseases and environmental sanitation and design of municipal facilities.

c) Transportation Engineering – intended for the student interested in the planning, design, construction, traffic operation and evaluation of streets, highways, airports, and transit. Emphasis is placed on planning, design, operation and evaluation, particularly as related to demands.

d) Geotechnical Engineering – designed to provide the student with an understanding of 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.

e) 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.

f) Hydrology and Hydraulic Engineering – intended for the student interested in the planning, management, design and operation of water supply and distribution systems, in flood control and flood hazard mapping, and in the hydrologic and hydraulic aspects of environmental issues.

g) Experimental Mechanics – for student with an interest in the experimental investigations of static and dynamic response of structures and machines, In theory and technique of experimental methods and in the rheology of materials used in experimental mechanics.

h) Materials – intended to provide the student interested in structural engineering, mechanics or properties of materials with a background in materials science.

or the student can choose a more general pattern of study involving some of the above.

It is difficult to give a simple definition of what a civil engineer is and does. Essentially the profession is principally involved with the creation, operation and maintenance of structures associated with water resources, transportation, power generation, and a wide range of industrial, commercial and institutional buildings and complexes including whole urban structures. The activities include investigation, planning, design, construction and evaluation. Vocationally a civil engineer may specialize in any of the foregoing. He or she may also specialize in 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 are involved in aquaculture. Civil engineering may also be combined with another
discipline or profession such as engineer-cost
analyst, engineer-economist, engineer-sociologist,
engineer-lawyer, engineer-biologist, engineer-
psychologist, engineer-medical doctor, etc. 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 Programme
a) Credit Courses
Civ E 116 Engineering Concept 2
Civ E 200 Civil Engineering Project 1
Civ E 203 Statics
Civ E 204 Dynamics
Civ E 205 Mechanics of Deformable Solids 1
Civ E 221 Calculus
Civ E 222 Differential Equations
Civ E 224 Probability and Statistics
Civ E 285 Structure and Properties of Materials
Civ E 280 Fluid Mechanics
Civ E 291 Survey Camp
Civ E 292 Engineering Economics
Civ E 294 Thermal Sciences
Civ E 300 Civil Engineering Project 2
Civ E 303 Structural Analysis 1
Civ E 304 Structural Analysis 2
Civ E 313 Structural Concrete Design 1
Civ E 342 Transport Engineering 1
Civ E 343 Transport Engineering 2
Civ E 353 Soil Mechanics
Civ E 354 Foundation Engineering
Civ E 381 Hydraulics
Civ E 400 Civil Engineering Project 3
Civ E 413 Structural Steel Design
Civ E 453 Engineering Geology
Civ E 486 Hydrology
Civ E 491 Engineering Law

b) Non Credit Courses
Civ E 296 Civil Engineering Seminars
Civ E 299 Civil Engineering Seminars
Civ E 396 Civil Engineering Seminars
Civ E 399 Civil Engineering Seminars
Civ E 498 Civil Engineering Seminars
Civ E 499 Civil Engineering Seminars

The above represent seminars and discussions
arranged by the department on topics of general
interest to civil engineers.

B) Electives
a) Technical Electives†
Elective courses may be selected from the following
list, in accordance with the academic programme for
the term, and in consultation with the Civil
Engineering Faculty advisor.
Civ E 306 Mechanics of Deformable Solids 2
Civ E 344 Urban and Regional Engineering
Civ E 383 Water Distribution and Collection
Systems
Civ E 403 Structural Analysis 3
Civ E 404 Structural Analysis 4
Civ E 405 Structural Dynamics and Stability
Civ E 414 Structural Concrete Design 2
Civ E 415 Structural Systems
Civ E 430 Experimental Mechanics
Civ E 440 Urban Traffic Management
Civ E 442 Pavement Structural Design
Civ E 444 Urban Transport Planning
Civ E 454 Geotechnical Engineering
Civ E 472 Wastewater Treatment
Civ E 473 Pollution In the Aquatic Environment
Civ E 480 Basic Principles of Water Resources
Civ E 493 Engineering in the Canadian North
Civ E 496 Project Management
Civ E 497 Engineering Optimization and Analysis

A number of elective courses may be taken from the
offerings of other departments. Each student is
responsible for selecting his or her own programme
of electives, in keeping with his ultimate career
objective after graduation.

b) General Studies Electives
Four courses, together with the general studies
course in the 1B term must satisfy the General
Studies Programme requirements described on
p. 129.
†The offering of these courses is contingent upon
sufficient demand and/or available teaching
resources.

C) Other Courses
Civ E 110†, Urban Transport Problems and Prospects
†Civ E 110 is not intended for Civil Engineering
students at any level. The offering of this course is
contingent upon sufficient demand and/or teaching
resources.
### Academic Programme for Each Term

**Civil Engineering**

**Year 1B (Winter and Spring Terms)**
Civ E 116, plus other Year courses

**Year 2A (Fall and Winter Terms)**
Civ E 203, Civ E 204, Civ E 221, Civ E 224, Civ E 265, Civ E 292, Civ E 298, Civ E 291†

**Year 2B (Spring and Fall terms)**
Civ E 200, Civ E 205, Civ E 222, Civ E 280, Civ E 294, Civ E 299; one general studies elective, Civ E 291†

**Year 3A (Winter and Spring terms)**
Civ E 303, Civ E 313, Civ E 342, Civ E 353, Civ E 381, Civ E 396; one general studies elective

**Year 3B (Fall and Winter terms)**
Civ E 300, Civ E 304, Civ E 343, Civ E 354, Civ E 375, Civ E 399; one elective chosen from Civ E 306, Civ E 344 or Civ E 383

**Year 4A (Spring and Fall terms)**
Civ E 413, Civ E 453, Civ E 486, Civ E 498; two electives chosen from Civ E 403, Civ E 414, Civ E 440, Civ E 472 or Civ E 496; one general studies elective

**Year 4B (Winter term)**
Civ E 400, Civ E 491, Civ E 499; three electives chosen from Civ E 404, Civ E 405, Civ E 415, Civ E 430, Civ E 442, Civ E 444, Civ E 454, Civ E 473, Civ E 480, Civ E 493 or Civ E 497; one general studies elective

†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 BASc in Civil Engineering with an Option in Management Sciences by taking 8 M Sci courses (see pg. 362) as electives. Note that M Sci 21 and M Sci 23 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 an average of 60% or more in those courses.

†A student who wishes to follow the Management Science Option, must declare his or her intent before embarking on his 2B term and must obtain the approval of the Civil Engineering Department.

### Electrical Engineering

**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 common Year 1 programme in Engineering, the programme in Electrical Engineering consists of prescribed core courses and a minimum of nine 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 programme 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 programme 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 1), unless admitted to advanced standing, as defined in the Calendar (see page 127).

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 A average in the previous term.

The promotion criteria will be as laid down in the Faculty rules (see page 127).

**Options in Electrical Engineering**
There are two options available to students in the department, one in Computer Engineering and one in Management Sciences. Students may take one or the other, but not both.

**Computer Engineering Option:**
This sequence of courses is designed to give Electrical Engineering students a greater training in software to augment their digital hardware capabilities. The courses and the terms in which they are taken are:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 240</td>
<td>Principles of Programming Languages and Data Structures</td>
</tr>
<tr>
<td>CS 340</td>
<td>Data Structures</td>
</tr>
<tr>
<td>CS 454</td>
<td>Principles of Operating Systems</td>
</tr>
<tr>
<td>EE 407</td>
<td>Numerical Analysis</td>
</tr>
<tr>
<td>EE 427</td>
<td>Digital Hardware Engineering</td>
</tr>
</tbody>
</table>

In addition to these courses, two other computer science courses, chosen from a list, will be taken in the fourth year in either the A or B term.
The courses CS 240 and CS 340, taken in the 2B and 3B terms respectively, would replace the General Studies Elective presently required. In each term of the fourth year the student would be required to take a General Studies Elective. Of the eleven courses taken in fourth year by students in this Option, two will be General Studies Electives, three would be Computer Science courses and the remaining six will be Electrical Engineering courses, including the two required Electrical Engineering courses. Students in this Option would not be allowed to take EE 426 as material in this course is largely covered by the Computer Science courses.

The successful completion of these courses results in a designation on your transcript "Option in Computer Engineering."

Management Science Option:
This is a sequence of eight courses designed for those students with an interest in the management of technology. The courses and the terms in which they are normally taken are:

M Sci 23  Managerial and Engineering Economics 1
M Sci 44  Organizational Behaviour 1
M Sci 46  Operations Research 1
El E 316  Probability and Statistics 1. (This is an El E core course accepted in place M Sci 21)
M Sci 53  Organizational Behaviour 2
M Sci 47  Operations Research 2
M Sci 43  Managerial and Engineering Economics 2
M Sci 31  Probability and Statistics 2

The successful completion of these courses results in a designation on your transcript "Option in Management Sciences". All courses are taken in place of non-technical and technical electives except MSc 23 and EE 316 which are core courses. In the 4B term, in addition to the two Management Science courses shown, three Electrical Engineering courses must be taken, one less than is taken by those students not in the option. If you have any questions as to the details of the option, please consult the Department Professor. The courses MSc 44, MSc 53 and MSc 43 are classified as non-technical electives.

Academic Programme 1981/82.

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 2A, Fall and Winter
Course
No.   Name               C  T  L
El E 201 Seminar         1   —  —
El E 205 Advanced Calculus for
(Math 211) Electrical Engineers 1
El E 222 Introduction to Digital
Computers
El E 233 Physical Electronics 3  1  —
El E 241 Electric Networks 1  3  2  —
El E 293 Instrumentation &
Measurement 1  1   4*
M Sci 23 Managerial & Engineering Economics 1

Term 2B, Fall and Spring
Course
No.   Name               C  T  L
El E 202 Seminar         1   —  —
El E 206 Advanced Calculus for
(Math 212) Electrical Engineers 2
El E 261 Energy Processing
& Conversion
El E 271 Electric & Magnetic Fields 3  1  —
El E 294 Instrumentation &
Measurement 2  1   3*
M E 250 Thermodynamics     3   1  —
General Studies Elective

Term 3A, Winter and Spring
Course
No.   Name               C  T  L
El E 301 Seminar         1   —  —
El E 316 Probability & Statistics 2  2  —
El E 323 Principles of Digital
Circuits and Systems
El E 342 Electric Networks 2  2  —
El E 351 Electronic Devices 2  1  3*
El E 362 Energy Conversion 2  1  3*
General Studies Elective

Term 3B, Fall and Winter
Course
No.   Name               C  T  L
El E 302 Seminar         1   —  —
El E 317 Signal Analysis Methods 3  1**
El E 352 Electronic Circuits 2  1  3*
El E 372 Transmission Lines &
Electromagnetic Fields
El E 380 Introduction to Systems &
Control
General Studies Elective

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

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 boundaries between pure research, applied research and professional practice become indistinct when the aim is to discover imaginative new ways to solve complex management problems. The research activities of the faculty members fall into two major categories: operations research, and organizational behaviour. A major aim of the Department is to strengthen and develop these fields of study.

Degrees Conferred
The department confers degrees only at the graduate level (the MASc and PhD). At the undergraduate level it provides, for a student progressing to a BASc in any other department of the Faculty of Engineering, the opportunity to complete an Option in Management Sciences.

Undergraduate Academic Programme
As mentioned above, 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
Electrical Engineering
Mechanical Engineering
Systems Design

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. It aims to impart a training that will be useful for problem-solving capability in the long run; also, it lets students acquire certain skills which should help widen the scope of their immediate employment. Students 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 eight courses (see course descriptions in Chapter 15), two in each of the following areas:

a) Probability and Statistics
   M Sci 21 Probability and Statistics 1
   M Sci 31 Probability and Statistics 2

b) Economics
   M Sci 23 Managerial and Engineering Economics 1
   M Sci 43 Managerial and Engineering Economics 2

c) Operations Research
   M Sci 46 Operations Research 1
   M Sci 47 Operations Research 2

d) Decision Analysis and Organizational Behaviour
   M Sci 44 Organizational Behaviour 1
   M Sci 53 Organizational Behaviour 2

The designation of an Option in Management Sciences will be shown on the student’s transcript when he or she achieves a grade of at least 50% in each of all eight courses (see above) or their equivalents as specified by the department of Management Sciences, and obtains an average of 60% or more in these courses.

A student may take any number of courses in the Option as electives, provided that the appropriate prerequisites* are satisfied. However, the designation of an Option in Management Sciences will not be shown on the transcript of a student who does not take all the eight courses specified above.

In addition to the Option courses, there is one other course offered by the department, namely M Sci. 48 Introduction to Production Management, that is available as an elective to undergraduate engineering students.

In order to facilitate the taking of all eight courses in the Option the student should proceed according to the following schedule beginning in the 2A term:

*Prerequisites are listed under course descriptions in Chapter 15.

Option in Management Sciences

<table>
<thead>
<tr>
<th>2A Fall</th>
<th>2A Winter</th>
<th>2B Spring</th>
<th>2B Fall</th>
<th>3A Winter</th>
<th>3A Spring</th>
<th>3B Fall</th>
<th>3B Winter</th>
<th>4A Spring</th>
<th>4A Fall</th>
<th>4B Winter</th>
</tr>
</thead>
<tbody>
<tr>
<td>ChEA</td>
<td>ChE220*</td>
<td>MSci44</td>
<td>ChE312†</td>
<td>MSci46</td>
<td>MSci53</td>
<td>MSci47</td>
<td>MSci31</td>
<td>MSci31</td>
<td>MSci31</td>
<td></td>
</tr>
<tr>
<td>ChEB</td>
<td>ChE220*</td>
<td>MSci44</td>
<td>MSci46</td>
<td>MSci47</td>
<td>MSci47</td>
<td>MSci31</td>
<td>MSci31</td>
<td>MSci31</td>
<td>MSci31</td>
<td></td>
</tr>
<tr>
<td>CivEA</td>
<td>CivE292†</td>
<td>CivE224*</td>
<td>MSci44</td>
<td>MSci46</td>
<td>MSci47</td>
<td>MSci47</td>
<td>MSci47</td>
<td>MSci47</td>
<td>MSci47</td>
<td></td>
</tr>
<tr>
<td>CivEB</td>
<td>CivE292†</td>
<td>CivE224*</td>
<td>MSci44</td>
<td>MSci46</td>
<td>MSci47</td>
<td>MSci47</td>
<td>MSci47</td>
<td>MSci47</td>
<td>MSci47</td>
<td></td>
</tr>
<tr>
<td>EIEA</td>
<td>MSci23</td>
<td>MSci44</td>
<td>MSci46</td>
<td>MSci31</td>
<td>MSci43</td>
<td>MSci43</td>
<td>MSci43</td>
<td>MSci43</td>
<td>MSci43</td>
<td></td>
</tr>
<tr>
<td>EIEB</td>
<td>MSci23</td>
<td>MSci44</td>
<td>MSci46</td>
<td>MSci53</td>
<td>MSci47</td>
<td>MSci47</td>
<td>MSci47</td>
<td>MSci47</td>
<td>MSci47</td>
<td></td>
</tr>
<tr>
<td>MEA</td>
<td>MSci21</td>
<td>MSci23</td>
<td>MSci43</td>
<td>MSci46</td>
<td>MSci47</td>
<td>MSci47</td>
<td>MSci47</td>
<td>MSci47</td>
<td>MSci47</td>
<td></td>
</tr>
<tr>
<td>MEB</td>
<td>MSci21</td>
<td>MSci23</td>
<td>MSci44</td>
<td>MSci46</td>
<td>MSci47</td>
<td>MSci47</td>
<td>MSci47</td>
<td>MSci47</td>
<td>MSci47</td>
<td></td>
</tr>
<tr>
<td>SyDeB²</td>
<td>SyDe213*</td>
<td>MSci46</td>
<td>MSci47</td>
<td>MSci43</td>
<td>MSci53</td>
<td>MSci53</td>
<td>MSci53</td>
<td>MSci53</td>
<td>MSci53</td>
<td></td>
</tr>
</tbody>
</table>

* Equivalent with MSci21
† Equivalent with MSci23
² SyDe131 (equivalent with MSci31) is taken in 1A
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 such as manufacturing, steel production, mining, transportation, communications, oil refining, chemical manufacture, paper, sugar, textiles, aerospace, and construction. In the last few years, because of the need to develop alternate energy sources, mechanical engineers have taken a major role in the development of new methods of energy conversion. The undergraduate programme 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.

The Mechanical Engineering undergraduate programme contains a core of basic subjects that must be taken by all students. The first year is 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 four years.

Each student is responsible for selecting his own programme 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, and turbomachinery.

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, weather prediction and modification, meteorology, 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 Option
The courses in this option are designed to provide the student with an understanding of the principles and control of production processes, the application of computers to the manufacturing activity and the organization of production. Topics treated are: automation, metal forming, numerical control of machine tools, applications of fluid power and industrial noise control.

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 eight specific Management Science courses as electives (see elective course listing under Department of Management Sciences).
A) Core Programme

a) Credit Courses
M E 201 Advanced Calculus
M E 203 Ordinary Differential Equations
M E 204 Numerical Analysis
M E 212 Dynamics
M E 215 Structure and Properties of Materials
M E 219 Mechanics of Deformable Solids 1
M F 220 Mechanics of Deformable Solids 2
M E 230 Control of Properties of Materials
M E 250 Thermodynamics
M E 305 Partial Differential Equations
M E 321 Partial Differential Equations
M E 322 Mechanical Design 1
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 462 Introduction to Automation
M E 482 Mechanical Engineering Projects
M Sci 21 Probability and Statistics (Equivalent to M E 202)
M Sci 23 Managerial and Engineering Economics 1
El E 14 Electrical Engineering 1
El E 32 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 programme will take three General Studies electives 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.
Eight technical elective courses are required in addition to the core courses listed above to fulfill the requirements of the Mechanical Engineering programme. Each student will, in addition, select and complete a two-term project (M-E 482) under the direct supervision of a Professor. The project requires the student to demonstrate initiative and assume responsibility. Each student is responsible for selecting his own programme of electives, and project, in keeping with his ultimate career objective. 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 else 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 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 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 F 527 Mechanics of Deformable Solids 3
M E 544 Welding
M E 568 Noise Analysis and Control
M E 626 Fatigue and Brittle Fracture
(See Graduate Calendar)

d) Engineering Materials Option
M E 432 Physical Metallurgy of Deformation and Fracture
M E 435 Industrial Metallurgy
M E 443 Metal Casting Processes
M E 527 Mechanics of Deformable Solids 3
M E 531 Physical Metallurgy of Structures and Transformations
The Mechanical Engineering curriculum structure is summarized in the following table.

<table>
<thead>
<tr>
<th>Term</th>
<th>Courses</th>
</tr>
</thead>
</table>

F=Fall term, W=Winter Term, S=Spring term
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 economic, social, human and political parameters must be given equally careful attention. When large scale problems are under study, few people can be knowledgeable in 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/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 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 programme in order for the programme to meet the standards of Canadian engineering. The Systems Design Engineering programme satisfies the strict standards of the CAB and is therefore acknowledged as a fully qualified Engineering Programme. In fact, the Department of Systems Design at the University of Waterloo, is the only department of its kind in all of Canada.

The Systems Design programme 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 programme for you.

The Department of Systems Design also offers programmes leading to MASc and PhD degrees, and in the past many Systems Design students have gone on to successfully complete graduate degrees. The faculty members of the Department are involved in a wide spectrum of research activities. Students who also wish to do research in one of these areas may start at the undergraduate level by entering the combined Bachelor-Masters programme 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 programme is quite challenging. It is not easy to acquire the tools for solving the problems of complex systems. Moreover, these tools are becoming more and more sophisticated. Thus, the average student in Systems Design 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-Economic Systems, and absorbs the implications of the tremendous growth of electronic computing systems.
Further information is available from:
Professor M. Chandrashekar
Associate Chairman for
Undergraduate Studies
Department of Systems Design
University of Waterloo
Waterloo, Ontario, N2L 3G1
(519) 885-1211 Ext. 2897

Professor K. Hipel
High School Liaison Officer
Department of Systems Design
University of Waterloo
Waterloo, Ontario, N2L 3G1
(519) 885-1211 Ext. 3113

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 and 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
- operational 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

The Undergraduate programme 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 programme 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 programme 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).

System Design 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 1
Sy De 181 Statics

1B (Spring Term)
Sy De 102 Tutorial
Sy De 112 Calculus 2
Sy De 114 Theory and Application of Probability
Sy De 122 Introduction to Computer Systems
Sy De 142 Introduction to Ergonomics
Sy De 162 Introduction to Systems Design 2
Sy De 182 Dynamics
Technical Options in Systems Design

Each undergraduate student in Systems Design must choose a technical option by the 3A term. At present the department regularly offers option programmes in

- Design & Human Systems
- Socio-Economic Systems
- and Physical & Computer Systems

Additionally there are option programmes called Management Sciences and Computer Engineering, offered in conjunction with the Management Sciences and Electrical Engineering Departments, respectively. Students who elect this option 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, will constitute an individual technical option for that student.

Each technical option in Systems Design 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
- 1 General Studies Programme elective

**3B**
- 5 mandatory courses
- 1 technical elective course
- 1 free elective course

**4A**
- 3 mandatory courses
- 3 technical elective courses
- 1 General Studies Programme elective

**4B**
- 3 mandatory courses
- 3 technical elective courses
- 1 General Studies Programme elective

Summary of The Systems Design 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 programme 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 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 to 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 operational 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 operational 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 microprocessors), 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, can obtain a background in Management Science in addition to his or her engineering degree. The Management Science programme for a Systems Design student consists of the following optional courses:
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%.

Special Individual Option
Some Systems Design students may wish to design their own option programme 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 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.
Faculty of Environmental Studies

Geography
Faculty of Environmental Studies

Introduction
The Faculty of Environmental Studies is equivalent in organization to any regular faculty, such as Arts, Science, and Engineering but is unique in its outlook. It concentrates on using diverse sources of knowledge from different disciplines needed to understand one particular problem area: man and his environment. Since many of the issues are contemporary, the faculty has attempted to utilize the best of traditional teaching approaches combined with newer and innovative techniques derived from a broad range of disciplines.

The Faculty of Environmental Studies has within it two types of academic groups - the professional Schools, and the academic Departments.

Schools and Departments
School of Architecture
Department of Geography
Department of Man-Environment Studies
School of Urban and Regional Planning

The professional schools are specialized, vocation oriented but they are not narrow. Through the Faculty of Environmental Studies, they are integrated into the mainstream of the University's concern with man and his environment, through the two main thrusts of research and practical applications.

The academic Departments represent a grouping of studies which have the interaction of man with his environment as their core. Both the Man-Environment 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 programmes of the other units, and it is an objective of the Faculty to make all its members available to students in any of its four units. Interaction with other parts of the University is also fostered, and joint appointments of faculty members with other Faculties and Schools 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 PhD Degree may be obtained in both Geography, and Regional Planning and Resource Development. In addition, the Geography and Man-Environment Studies Departments offer joint honours programmes with many other departments in the University (see programmes for other details).

Degrees may be obtained in the following programme areas:

BES - Pre-professional Architecture (3 years), on rotating work/study co-operative scheme.
BArch - Professional Architecture (2 years, with co-operative work terms following completion of the BES Pre-professional Architecture).
BES - Honours Geography (4 years)
BES - Honours Co-operative Geography (5 years with rotating work/study terms)
BES - Major in Geography (3 and 4 years).
BES - Honours Man-Environment Studies (4 years).
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 programme. 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 2.

The Dean's Honours List will include no more than 5% of the students in any particular year based on scholastic achievement. The criteria for a student's inclusion shall be based on the major average and no one included on the list shall have an overall average of less than 75%.

The Faculty has several awards granted to students for meritorious performance, e.g. Dean's Honours List, Gold Medal, monetary prizes. Further information on this can be obtained from the office of the Associate Dean, Undergraduate Affairs.
Admission

The admission requirements and procedures for all programmes are outlined in detail in Chapter 2 of this Calendar. The following points emphasize some of the admission requirements which relate specifically to programmes 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 Mathematics course for admission to programmes in Environmental Studies; Grade 13 Geography is similarly recommended for those applying to the Geography Department. For applicants to the School of Architecture, Functions and Relations, Calculus, Physics and English (Français) at the Ontario Grade 13 level are required.

Interviews

Students being seriously considered for admission to the Schools of Architecture and Urban and Regional Planning are normally required to participate in an interview as part of the admissions process. For Architecture, a test will be conducted by the School on the day of the interview to establish ability to comprehend the various thematic areas. A portfolio of creative work must 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% 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 programme. 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 programme or Faculty and students are advised to refer to the programme or Faculty sections in the Calendar for detailed regulations.

English Language Proficiency Programme

The Faculty of Environmental Studies expect that students enrolled in any of its programmes 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 of 50.0% on this Examination. If students do not achieve a passing grade of 50% on this examination, they must successfully complete the assignments of the University of Waterloo Writing Clinic. The English Language Proficiency Programme is recorded on students' academic record as Arts 000 Y.

Examinations and Standings

The following regulations govern the practice 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 programmes. Further details concerning University Examination Regulations can be found in Chapter 1, page 18.

A maximum of eight first year credits will be counted towards a BES. For other requirements, see the programme section for the Department/School.

Students should note that the Faculty of Environmental Studies operates under a "course system" in which student progress is measured by courses successfully completed rather than by years. Students who passed fewer than five courses will be considered Year 1 students; those who have passed at least five courses but fewer than ten will be considered Year 2 students; those with at least ten but fewer than sixteen, Year 3, and those with sixteen or more, Year 4.

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. 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 Affairs, for discussion with the Faculty Undergraduate Affairs 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) Overall standing is determined by the cumulative average of grades assigned for all courses taken at the University except where a course is retaken, in which case the second grade will be included in the cumulative average regardless of whether it is higher or lower than the first. 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 programme 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 courses will be allowed 4 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.

d) To be considered in good standing in the Honours programmes, a student must maintain a cumulative overall average of at least B - (70.0) and an average in the chosen field of specialization as specified in the regulations of the relevant department/school. If an Honours programme candidate’s average falls below the prescribed minimum, the individual can be given conditional standing 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 Programme and the regulations in (e) below will apply.

e) To be considered in good standing in the General Geography Programmes, a student must maintain a cumulative overall average of at least C - (60.0) as well as an average of at least C (65) in Geography. If at any time a student’s average falls below C - (60.0) or the average in Geography below C (65), the individual may be granted conditional status for one year, during which period he/she must make reasonable progress toward obtaining good standing or he/she will be asked to withdraw. A student whose cumulative overall average fails below D (55) may continue only with the permission of the Undergraduate Affairs Committee.

f) The only general programmes in the Faculty are the General Geography Programmes. The BES programme in the School of Architecture is a pre-professional programme. A regular (full-time) student in the General Geography Programmes must in each academic year enrol in at least five courses, but in not more than six. A regular
student in the Honours programmes must each year enrol in at least six courses (unless otherwise specified in a departmental Honours programme), but in not more than seven. Students may be enrolled for reduced programmes after obtaining the approval of the appropriate Undergraduate Affairs Officer.

g) Even while otherwise in good standing, a student who fails more than two course credits 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 “Failed, Required to Withdraw” decision, he/she must withdraw from that program for a year; that student is entitled to apply to any other program; if the reasons for withdrawal include disciplinary problems, a statement should be placed in the student's file.

5) Additional Regulations, School of Architecture
Examinations and Promotions

In order to proceed unconditionally from one term* to the next in the BES and BArch programmes, 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 (13 week) 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 programme 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 “Failed – Required to Withdraw”.

Note 1

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 “Failed-Required to Withdraw”.

Note 2

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 “Failed – 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.

Note 3

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 “Failed – Required to Withdraw”.

Note 4

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 “Failed – Required to Withdraw”.
Note 5
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) programme 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 3) a, b, c, above.

Similarly, students who have been granted conditional status on one previous occasion during the course of the BArch programme 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 3) a, b, c, above.

Note 6
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 programme must be approved by the Undergraduate Officer of the School of Architecture.

The following procedures have been set out for those students who have not met the above conditions.

Supplemental Examinations
A student failing any Architecture course with an F+ standing has supplemental examination privileges and may take such an examination as arranged in accordance with University policy.

Appeals
See Faculty procedures, p. 152.

Academic Programmes

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 programme, the student should read the descriptions of individual courses in order to have a more comprehensive idea of what the content of any programme 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.

Course and Programme Changes
a) Students may freely add and drop term and year courses before and during the first two weeks of classes in the term in which the courses begin.

b) After the two week periods, students may add and drop courses only with the written permission (signatures) of the course instructor and of the appropriate undergraduate officer on the schedule.

c) All schedule changes at any time must be submitted to the designated department office.

d) After the first two weeks of classes but before November 1 (Fall), March 1 (Winter), and July 1 (Spring), students enrolled in more courses than their programmes require may drop courses. This requires the signature of the appropriate undergraduate officer on the schedule.

e) Students may reduce their programmes below the specified minimum only upon the recommendation of the undergraduate officer of the major department.

f) Courses not dropped by the deadlines specified in d) will be graded and included in the calculation of the student's average.

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.

The Calendar is designed to enable students to make a wise choice of the programmes 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.

Caution - 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 programme.

The Faculty of Environmental Studies offers two Faculty Options for students enrolled in Honours programmes: Environmental and Resources Management Option and Regional Development Option. These are comprised of groups of courses correlated with the theme area. If a student passes all these courses with the required standing (B), the Option will be noted on their transcript.

Environmental and Resources Management Option

1) Required Courses
Env S 195A Introduction to Environmental Studies
Env S 200 Field Ecology
Env S 401 Environmental Law
Geog 356 Resources Management
Geog/Plan 357 Conservation and Resource Management
M Env 320  Environmental Economics
Env S 444  Land Evaluation and Resources Management

2) Some Electives
   a) Techniques/Methods (Minimum of 2)
   Env S 271  Introduction to Quantitative Research Methods
   Plan 255  Planning Surveys and Analysis
   Plan 307  Social Survey Techniques
   Plan 319  Economic and Social Techniques for Regional Planning
   Geog 260  Introduction to Cartography and Analysis
   Geog 275  Introductory Air Photo Analysis and Remote Sensing
   M Env 250  Environmental Issues: Methods & Techniques

   b) Content Courses
   Env S 358  Environmental Pollution and its Control
   Env S 417  Land Use History and Landscape Change 1
   Env S 418  Land Use History and Landscape Change 2
   Geog 102  Introduction to Physical Geography
   Geog 201  Some Basic Topics of Physical Geography
   Geog 300  Geomorphology and the Southern Ontario Environment
   Geog 315  Agricultural Geography
   Geog 408  Special Topics in Climatology and Natural Hazards
   Geog 410  Recreation Geography
   Geog 411  Resource Studies
   Geog 414  Resources Management Workshop
   Geog 461  Land Dereliction & Rehabilitation 1
   Plan 156  Introduction to Urban and Regional Planning Concepts
   Plan 256  Principles of Environmental Design
   Plan 370  Land Development Planning
   M Env 375E  Land and Leisure: Concepts and Methods in Recreational Land Use
   Arch 223  Human Ecology
   Arch 244  History of Gardens of Europe and Western Asia
   Arch 245  Survey of Contemporary Architecture

   c) Other substitute courses can be taken with permission of the co-ordinator or Associate Dean of Undergraduate Affairs.
   1) Students must take courses in the three categories outlined above.
   2) A minimum of ten half course credits must be completed and students must achieve an average of "B" in these courses.

   d) Many students will normally be required to take the majority of these courses as core requirements, and are advised to take additional electives. It should also be noted that certain prerequisites will be necessary for the required courses listed above.

Regional Development Option

Required Courses (7 half-course credits)
   Plan 156  Introduction to Urban and Regional Planning Concepts
   Geog 101  Introduction to Human Geography
   Geog 202  Some Basic Topics of Economic and Urban Geography
   Geog 350  Regional Urban Systems 1
   Plan 319  Economic and Social Techniques for Regional Planning

   one of
   Plan 358*  Regional Planning and Development
   Plan 222  Canadian Regional Issues
               or
   Geog 322  Geographical Study of Canada

Elective Courses (3 half-course credits minimum)
   Civ Eng 110  Contemporary Issues in Canadian Public Policy
   Geog 203  Some Basic Topics of Cultural and Regional Geography
   Geog 315  Agricultural Geography
   Geog 349  The City as a System 1
   Geog 352  The Rural-Urban Fringe of Canadian Cities
   Geog 412  Geography of Manufacturing Firms and Industries
   Geog 449  The City as a System 2
   Geog 450  Regional Urban Systems 2
   Geog 452  Problems of Rural Land Use
   M Env 320  Environmental Economics
   M Env 247  Urban Anthropology
   M Env 445  Technology Assessment and Policy Analysis
   Hist 204C  Canadian Urban History
   Plan 332  The Sociology of Regions
   Plan 333  The Sociology of Regional Planning
   Plan 360  Technology in Urban and Regional Planning
   Plan 430  Social Policy Planning
   Plan 456*  Political and Administrative Processes in Urban and Regional Planning

   *Available to Planning students only.
Courses in the Natural Resources - Ecology Theme
The following courses provide a possibility for students to orient their programmes to stress natural resources and ecology. Students are encouraged to see the Chairman of the Natural Resources - Ecology Committee (Dean's Office).

Ecology-Biology
- Env S 200: Field Ecology
- Env S 201: Introduction to Environmental and Planning Law
- Geog/Plan 357: Conservation and Resource Management
- Biol 111: Introductory Biology 1
- Biol 112: Introductory Biology 2
- Biol 250: Ecology
- Env S 401: Environmental Law
- Env S 417: Land Use History and Landscape Change 1
- Env S 418: Land Use History and Landscape Change 2

Physical
- Geog 102: Physical Geography
- Geog 201: Physical Geography
- Geog 300: Geomorphology and the Southern Ontario Environment
- Geog 301: Climatology
- Geog 302: Geomorphology
- Geog 303: Water
- M Env 356: Canadian Non-Renewable Resources
- Geog 408: Hazards
- Geog 461/462: Land Dereliction and Rehabilitation
- Earth 121: Introductory Geology 1
- Earth 122: Introductory Geology 2
- Earth 438: Engineering Geology

Human
(Economic, Social, Policy)
- M Env 357: Resource Use
- M Env 331: International Environment
- Geog 356: Resource Management
- Geog 410: Recreation
- Geog 411: Investment & Resources
- M Env 445: Technology and Policy
- Env S 310: Behavioural Studies
- Geog 414: Resource Management
- M Env 410: Environmental Assessment
- Env S 417: Land Use History and Landscape Change 1
- Env S 418: Land Use History and Landscape Change 2

In addition are some basic techniques - Surveying and mapping, cartography, statistical analysis, air photo interpretation, computer science, field methods, cost benefit (resources-economics).

Applied Environmental Methods
The Environmental Studies Methods Committee coordinates and develops courses, programmes and facilities applicable to environmental research and teaching including: general research and study methodologies, computer applications, regional information systems, computer cartography, ecosystem simulations, and modelling.

A new methods area has been established where printed output and CRT terminals, a graphics terminal, map digitizer, plotter, and thermal copies are located in a research room, graphics lab, tutorial/lecture room and student work room. Computer access and associated consulting support is available to students.

Numerous formal and reading courses are available in the Faculty for students interested in pursuing a methods emphasis in their degree programme. An important developing area is computer aided (building) design. A co-operative project by Architecture and Planning with Public Works Canada is central to this advance.

Interested persons should contact any of the following committee members: R. Newkirk (Chairman), D. Dudycha, E. Farkas, L. Martin, D. McIntyre, L. Russwurm, R. Schuster, and T. Semple for further information.

Courses in the Social Sciences
To deal adequately with environmental problems it is becoming increasingly essential that students have some understanding of the data and methods of the social sciences. There is at present no official "social science theme" within the Faculty, since the particular combinations of social science courses will vary from one school or department to another, and will change according to different vocational needs on the part of students. However, a wide range of appropriate courses in the concepts and skills of the social sciences exists both within the Faculty of Environmental Studies and elsewhere in the University. Guidance about particular courses for different student career paths is available from any member of the Social Science Framework Committee, which is charged with monitoring social scientific aspects of the curriculum. Faculty members of this committee are: C. Knapper (Chairman), T. Bunting, K. Izumi, B. Mitchell, G. Priddle, and S. Lerner.

As part of their undergraduate programme, students may become involved in gathering data from human subjects - for example by means of interviews or surveys. All projects that involve the gathering of such human data must receive the approval of the Committee on Research Involving Human Subjects, and students should ensure that their instructor or supervisor has requested and obtained such approval.
The following statements outline the objectives and nature of the four programmes in the Faculty of the Environmental Studies.

**School of Architecture**

**Nature of the Programme**

Architects decide how spaces within and about buildings shall be organized. It is they who determine the shape the total building will take and how it is to be built. They design at major scale with 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 shall 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 programme 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 society it serves.

The five years of architectural studies are made up of: a pre-professional, 3 year Bachelor of Environmental Studies programme leading to a 2 year professional programme of study for the Bachelor of Architecture degree. Both programmes are on the co-operative system which consists of alternating periods of academic study and practical work experience.

**Degrees**

The pre-professional architecture programme 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 four months duration, leading to the degree. Bachelor of Architecture (BArch).

---

**Non-Architecture Students**

Students not enrolled in the School of Architecture may take any architectural course listed in the recommended core programme 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) Programme**

The purpose of the BES programme 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 programme aims to build up knowledge and expertise in various aspects of building and architectural design.

1) the design studio, theories and methods, and practice of architectural design
2) studies of systems and measures including computer, physical and material sciences
3) cultural history in the human environment
4) environmental studies, including natural and human ecology.

See Recommended Core Programme for course arrangement, page 158. See chapter 15 for course descriptions.

**Bachelor of Architecture Programme**

The Bachelor of Architecture programme 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 programme are normally devoted to a design thesis.

**Note**

Students are expected to defray costs of materials in connection with studio projects.

See Recommended Core Programme for course arrangement. See Chapter 15 for course descriptions.
### Programme for the Degree of Bachelor of Environmental Studies (Pre-Professional Architecture)

<table>
<thead>
<tr>
<th>Year/Term</th>
<th>Systems and Measures Theme Area</th>
<th>Ecology Theme Area</th>
<th>Culture Theme Area</th>
<th>Design Theme Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-A</td>
<td></td>
<td>Env S 195A</td>
<td>Arch 142</td>
<td>Arch 192</td>
</tr>
<tr>
<td>Fall</td>
<td>Arch 175</td>
<td>Introduction to</td>
<td>Iconography 1</td>
<td>Design Fundamentals</td>
</tr>
<tr>
<td>Sept-Dec</td>
<td>Math</td>
<td>Environmental</td>
<td>(1 credit)</td>
<td>(1-1/2 credits)</td>
</tr>
<tr>
<td></td>
<td>CS 116 (Arc)</td>
<td>Studies</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Introduction to Computers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL 4 cr.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year/Term</th>
<th>Systems and Measures Theme Area</th>
<th>Ecology Theme Area</th>
<th>Culture Theme Area</th>
<th>Design Theme Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>1B</td>
<td></td>
<td>Arch 103</td>
<td>Arch 143</td>
<td>Arch 193</td>
</tr>
<tr>
<td>Winter</td>
<td>Statistics</td>
<td>Iconography 2</td>
<td>Design Fundamentals</td>
<td>Design Fundamentals</td>
</tr>
<tr>
<td>Jan-Apr</td>
<td></td>
<td>(1 credit)</td>
<td>and Studio</td>
<td>(1-1/2 credits)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL 4 cr.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Off-Term Spring**

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 on co-operative programmes).

<table>
<thead>
<tr>
<th>Year/Term</th>
<th>Systems and Measures Theme Area</th>
<th>Ecology Theme Area</th>
<th>Culture Theme Area</th>
<th>Design Theme Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-A</td>
<td></td>
<td>Arch 213*</td>
<td>Arch 246</td>
<td>Arch 292</td>
</tr>
<tr>
<td>Fall</td>
<td>Computer Generated Design or FE</td>
<td>Introduction to</td>
<td>Foundations of</td>
<td>Design Concepts</td>
</tr>
<tr>
<td>Sept-Dec</td>
<td></td>
<td>Landscape Design</td>
<td>Europe</td>
<td>and Studio</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(1 credit)</td>
<td>(1-1/2 credits)</td>
</tr>
<tr>
<td></td>
<td>Arch 262</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL 4 cr.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Co-op Work Term 1 Winter**

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, etc.

<table>
<thead>
<tr>
<th>Year/Term</th>
<th>Systems and Measures Theme Area</th>
<th>Ecology Theme Area</th>
<th>Culture Theme Area</th>
<th>Design Theme Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-B</td>
<td></td>
<td>Arch 212*</td>
<td>Arch 247</td>
<td>Arch 293</td>
</tr>
<tr>
<td>Fall</td>
<td>Computer Science Simulation or FE</td>
<td>Introduction to</td>
<td>Renaissance to Revolution</td>
<td>Design Concepts</td>
</tr>
<tr>
<td>Sept-Dec</td>
<td></td>
<td>Human Ecology</td>
<td>(1 credit)</td>
<td>and Studio</td>
</tr>
<tr>
<td></td>
<td></td>
<td>or TE</td>
<td></td>
<td>(1-1/2 credits)</td>
</tr>
<tr>
<td></td>
<td>Arch 263</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL 4 cr.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Co-op Work Term 2 Fall**

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; etc.

<table>
<thead>
<tr>
<th>Year/Term</th>
<th>Systems and Measures Theme Area</th>
<th>Ecology Theme Area</th>
<th>Culture Theme Area</th>
<th>Design Theme Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>3A</td>
<td></td>
<td>Arch 372 F.E.*</td>
<td>Arch 346*</td>
<td>Arch 392</td>
</tr>
<tr>
<td>Winter</td>
<td>Mechanical Systems 1</td>
<td>Romanticism and</td>
<td>Design Concepts</td>
<td></td>
</tr>
<tr>
<td>Jan-Apr</td>
<td></td>
<td>20th Century</td>
<td>and Studio</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>or FE</td>
<td>(2 credits)</td>
<td></td>
</tr>
<tr>
<td>TOTAL 3½ cr.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Co-op Work Term 3 Spring**

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; etc.

<table>
<thead>
<tr>
<th>Year/Term</th>
<th>Systems and Measures Theme Area</th>
<th>Ecology Theme Area</th>
<th>Culture Theme Area</th>
<th>Design Theme Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-B</td>
<td></td>
<td>Arch 313*</td>
<td>Arch 393</td>
<td></td>
</tr>
<tr>
<td>Fall</td>
<td>Computer Generated Design or FE</td>
<td></td>
<td>Design Concepts</td>
<td></td>
</tr>
<tr>
<td>Sept-Dec</td>
<td></td>
<td></td>
<td>and Studio</td>
<td>(2 credits)</td>
</tr>
<tr>
<td></td>
<td>Arch 363</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL 3½ cr.</td>
<td></td>
<td></td>
<td></td>
<td>Theory of Structures 2</td>
</tr>
</tbody>
</table>

TOTAL 23 credits
Programme for the Degree of Bachelor of Architecture

<table>
<thead>
<tr>
<th>Year/Term</th>
<th>Systems and Measures</th>
<th>Ecology</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 8 months may serve many objectives. A student after the first degree programme has time in which he may travel and decide about his future goals before returning to the School for the second degree programme. During that time a student may continue the co-op terms wherein he obtains experience in design research; in assisting in the development of conceptual designs and schematics, preparation of site plans and details, floor plans, elevations, cross-sections and standard details; in assisting the site architect or construction superintendent; etc.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 &amp; 5 Winter and Spring Jan-Aug</td>
<td>Arch 452 Specifications</td>
<td>Arch 492 Design Studio (2 credits)</td>
<td></td>
</tr>
<tr>
<td>Arch 462 Structural Synthesis 1</td>
<td>Arch 472 Mechanical Systems 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arch 455* Management and Estimating or FE</td>
<td>Arch 423** Urban Planning or TE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arch 463 Structural Synthesis 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arch 554* Development and Financing or FE</td>
<td>Arch 592 Design Studio (3 credits)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arch 555 Architectural Practice</td>
<td>Arch 593 Design Studio (3 credits)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arch 592 Design Studio</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arch 593 Design Studio</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

TOTAL 14 credits

* The course may be replaced by a 'free elective'
** The course may be replaced by a 'theme elective'

FE (Free Elective) constitutes any course in any Faculty at the University of Waterloo.
TE (Theme Elective) constitutes a recommended course in the Faculty of Environmental Studies.

Note Department approval of electives is mandatory.
Co-operative Programmes

The Bachelor of Environmental Studies programme includes six terms of study, three four-month co-operative work terms and one "off-term". The subsequent Bachelor of Architecture programme consists of four terms of academic study and two co-operative work terms, of four months each. The work terms must be approved by the Department of Coordination and Placement.

Note

The "off-term" in the Bachelor of Environment Studies pre-professional programme follows the first two terms of study (from September to April) in Year 1. 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 following charts.

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 judgement to assume responsibility for any medium sized building project.

English Language Proficiency Programme

The Faculty of Environmental Studies expect that students enrolled in any of its programmes 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 Programme is recorded on the student's academic record as Arts 000 Y.

Department of Geography

Nature of the Programme

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) programme in Honours Geography provides students with almost unlimited freedom to choose supporting electives from across the whole University. Thus, in consultation with professors, students will be able to have a tailor-made programme to suit their particular needs, whether they are primarily interested in physical or human geography, regional or systematic topics, or a combination of these. Certain approved options may be designated on a student's transcript; these are specified on p. 165. The Department has Joint Honours programmes with a number of other departments on campus (see page 167).

The Honours Geography Programme provides a sound, well-rounded foundation in the discipline, and prepares the student for specialization at the graduate level in almost any aspect of Geography. The programme includes a group of mandatory core courses that provides a balance of content and technique. The content courses include a series of integrated courses in both physical and human geography. The technique courses include field methods, remote sensing, cartography, statistical analysis, and computer use. The fourth year includes a research project known as the Senior Honours Essay.

Although the Honours Programme is broad in scope, six major aspects of the discipline have been formalized into options. The Honours student may take one of these options, as specified on p. 165 though this is not in any way required. Further concentration is possible by careful selection of courses from related fields in other parts of the University. However, should students wish to design their programmes along other lines of specialization, or to pursue non-specialized programmes the Department will be pleased to assist.

The Department of Geography also offers an Honours Co-operative Programme. Students are admitted to the Co-operative Programme only after first year. Since competition occurs for places in the Co-op Programme, admittance is based on academic standing and interviews. The Co-op Programme provides for alternate terms of practical work experience and academic study. Co-op Geography students will enter their first work term in the Winter
of the second year. Entry into the Honours Co-operative Programme requires specific courses in the first year (see page 163). The minimum number of successful work terms required for a Co-operative degree is normally four. Co-op Geography students are required to specialize in one of the theme areas outlined for the Co-op programme (p. 165). Inquiries for additional information regarding Co-operative studies should be directed to the Associate Chairman of the Department. The Co-op Geography Programme is not available in the Faculty of Arts.

The General Geography Programmes offer a fundamental education in Geography balanced with a variety of elective courses to complement the student's area of interest. These programmes are designed for students seeking some specialization in Geography while maintaining flexibility in their educational pursuits outside the discipline. The Department of Geography offers General Programmes at both the three and four-year level.

A programme of correspondence courses is being developed which will allow a student to complete a General BES or BA in Geography. Upon successful completion, students taking the Geography Programme in the Faculty of Environmental Studies will receive a BES (Bachelor of Environmental Studies) degree and those in the Faculty of Arts will receive a BA (Bachelor of Arts) degree. The Co-op Geography Programme is not available in the Faculty of Arts.

In all programmes there is emphasis on both the development of theory and methodology and on 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 programme 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.

The Department of Geography offers both Master's (MA) and PhD graduate programmes. At the graduate level course work and research is 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, and Europe.

Bachelor of Environmental Studies

Undergraduate Geography Courses

Note 1
All courses are open to any student from any Faculty or School of this University whenever prerequisites are met and space permits.

Note 2
The Department of Geography offers General and Honours Programmes both in the Faculty of Environmental Studies (BES) and the Faculty of Arts (BA). Joint Honours Programmes with most departments in the University may be arranged subject to approval. For further discussion of these programmes see p. 167.

Note 3
The division suffix R designates courses given through Renison College.

Note 4
Geog 101 and Geog 102 are given in both fall and winter terms. It is immaterial which of these courses is taken first as neither is sequential to the other.

Note 5
Courses designated "Environmental Studies" (p. 322) are included with geography courses in the calculation of the major average.

Note 6
Most courses with a laboratory component of 2 hours or more are given a credit weight of 0.75.

BACHELOR OF ENVIRONMENTAL STUDIES
GENERAL GEOGRAPHY
A) Three Year Programme

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Geog 101</td>
<td>Introduction to Human Geography</td>
</tr>
<tr>
<td></td>
<td>Geog 102</td>
<td>Introduction to Physical Geography</td>
</tr>
<tr>
<td></td>
<td>Geog 110</td>
<td>Introduction to the Field of Geography</td>
</tr>
</tbody>
</table>

and one of, but not more than two of:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Env S 195A</td>
<td>Introduction to Environmental Studies or:</td>
</tr>
<tr>
<td>Env S 195B</td>
<td>Introduction to Environmental Problems</td>
</tr>
<tr>
<td>Geog 125R</td>
<td>Introduction to the Third World</td>
</tr>
<tr>
<td>Geog 126R</td>
<td>Development in the Third World</td>
</tr>
<tr>
<td>Geog 127</td>
<td>Regional Problems of Europe and additional credits to a maximum of six.</td>
</tr>
</tbody>
</table>
Year 2
Env S 200  Field Ecology
Geog 201  Some Basic Topics of Physical Geography
Geog 202  Some Basic Topics of Economic and Urban Geography

one of:
Geog 203  Some Basic Topics of Cultural and Regional Geography
Geog 204  Soviet Union
Geog 205  Africa
Geog 220  World Regional Geography
Geog 221  The United States

and additional credits so that a student should have completed by the end of the second year 11 credits.

Year 3
Geog 381  The Nature of Geography
Additional credits so that a student will have completed at least 16 credits of which at least 6 are in Geography and 4 are outside the Faculty of Environmental Studies.

B) Four Year Programme

Year 1
Geog 101  Introduction to Human Geography
Geog 102  Introduction to Physical Geography
Geog 110  Introduction to the Field of Geography

and one but not more than two of:
Env S 195A  Introduction to Environmental Studies
or
Env S 195B  Introduction to Environmental Problems
Geog 125R  Introduction to the Third World
Geog 126R  Development in the Third World
Geog 127  Regional Problems of Europe

and additional credits to a maximum of six

Year 2
Env S 200  Field Ecology
Geog 201  Some Basic Topics of Physical Geography
Geog 202  Some Basic Topics of Economic and Urban Geography

one of:
Geog 203  Some Basic Topics of Cultural and Regional Geography
Geog 204  Soviet Union
Geog 205  Africa
Geog 220  World Regional Geography
Geog 221  The United States

one of:
Geog 260  Introduction to Cartography and Map Analysis
Geog 275  Introductory Air Photo Analysis and Remote Sensing
Env S 271  Introduction to Quantitative Research Methods

and additional credits so that a student should have completed by the end of second year 11 credits.

Years 3 and 4
Geog 381  The Nature of Geography

one of:
Geog 260  Introduction to Cartography and Map Analysis
Geog 275  Introductory Air Photo Analysis and Remote Sensing
Env S 271  Introduction to Quantitative Research Methods

and two full credits in Geography at the 300 level or above.

Additional credits so that a student will have completed at least 21 credits of which at least 9 are in Geography and 4 are outside the Faculty of Environmental Studies.

Notes on General Programme (3 year and 4 year)

Note 1
Sixteen credits is the minimum requirement for the three year General Degree of Bachelor of Environmental Studies; twenty-one credits is the minimum for the four year General Degree.

Note 2
In the three year programme a minimum of six credits in Geography constitutes a Geography major. One of these six credits may be designated as Environmental Studies. In the four year programme a minimum of nine credits in Geography constitutes a Geography major. One and one-half of these credits may be designated Environmental Studies. Students in both programmes may choose additional Geography electives, and are encouraged to do so.

Note 3
Students must take a minimum of four course credits in Faculties other than the Faculty of Environmental Studies.

Note 4
Students must maintain an overall average of C - (60.0) with a major average of C (65.0).
Note 5
Students in the four year programme may take
minors and options (as outlined for Environmental
Studies, p. 154 and for Geography, p. 165) in a
manner analogous to Honours Students.

HONOURS GEOGRAPHY
A) Regular Programme

Year 1
Geog 101 Introduction to Human Geography
Geog 102 Introduction to Physical Geography
Geog 110 Introduction to the Field of Geography
Math 105 Math for Environmental Studies (only
if no Grade 13 Math.)

and one of, but not more than two of:
Env S 195A Introduction to Environmental Studies
or:
Env S 195B Introduction to Environmental
Problems
Geog 125R Introduction to the Third World
Geog 126R Development in the Third World
Geog 127 Regional Problems of Europe

Electives: see below.

Year 2
Env S 200 Field Ecology
Geog 201 Some Basic Topics of Physical
Geography
Geog 202 Some Basic Topics of Economic and
Urban Geography

two of:
Geog 260 Introduction to Cartography and Map
Analysis
Geog 275 Introductory Air Photo Analysis and
Remote Sensing
Env S 271 Introduction to Quantitative Research
Methods

and one of:
Geog 203 Some Basic Topics of Cultural and
Regional Geography
Geog 204 Soviet Union
Geog 205 Africa
Geog 220 World Regional Geography
Geog 221 The United States

Electives: see below.

Year 3
Geog 301 The Nature of Geography
Geog 390 Senior Honours Research Essay
Proposal
Geog 301 Field Research

and one of:
Geog 260 Introduction to Cartography and Map
Analysis
Geog 275 Introductory Air Photo Analysis and
Remote Sensing
Env S 271 Introduction to Quantitative Research
Methods

and one of:
Geog 316 Multivariate Statistics
Geog 317 Nonparametric Statistics
Geog 318 Spatial Analysis

Electives: see below

B) Co-operative Programme

Year 1
Geog 101 Introduction to Human Geography
Geog 102 Introduction to Physical Geography
Geog 110 Introduction to the Field of Geography
Math 105 Math for Environmental Studies
(only if no Grade 13 Math)
Plan 156 Introduction to Urban and Regional
Planning Concepts

and one but not more than two of:
Geog 125R Introduction to the Third World
Geog 126R Development in the Third World
Geog 127 Regional Problems of Europe
Env S 195A Introduction to Environmental Studies
or:
Env S 195B Introduction to Environmental
Problems

and two of:
Geog 203 Some Basic Topics of Cultural and
Regional Geography
Geog 204 Soviet Union
Geog 205 Africa
Geog 220 World Regional Geography
Geog 221 The United States

Electives: see below.

Theme Courses
One credit in areas outside the Faculty of
Environmental Studies, e.g. Business, Economics,
Languages, Earth Sciences, Biology. Note that in
Year 2 students must identify a continuing theme
(see note 12 below).

Electives: see below
### Environmental Studies
#### Geography

#### Year 2

**Fall Term 2A Core Courses**
- Env S 200 Field Ecology

*One of:*
- Geog 260 Introduction to Cartography and Map Analysis
- Geog 275 Introductory Air Photo Analysis and Remote Sensing
- Env S 271 Introduction to Quantitative Research Methods

**Theme Courses**
See Note 12.

**Electives:** see below

**Winter Term**
- Work Term 1

**Spring Term 2B Core Courses**
- Geog 201 Some Basic Topics of Physical Geography
- Geog 202 Some Basic Topics of Economic and Urban Geography
- Engl 210 Report Writing

*One of:*
- Geog 203 Some Basic Topics of Cultural and Regional Geography
- Geog 204 Soviet Union
- Geog 205 Africa
- Geog 220 World Regional Geography
- Geog 221 The United States

*One of:*
- Geog 316 Multivariate Statistics
- Geog 317 Nonparametric Statistics
- Geog 318 Spatial Analysis

**Theme Courses**
See Note 12.

**Electives:** see below

**Fall Term**
- Work Term 2

**Year 3**

**Winter Term 3A Core Courses**
- Geog 381 The Nature of Geography
- Env S 272 Computer Programming in Environmental Studies

**Theme Courses**
See Note 12.

**Electives:** see below

**Spring Term**
- Work Term 3

**Fall Term 3B Core Course**
- Geog 390 Senior Honours Research Essay Proposal

**Theme Courses**
See Note 12.

**Electives:** see below

**Year 4**

**Winter Term**
- Work Term 4

**Spring Term 4A Core Course**
- Geog 490A Senior Honours Research Essay

**Theme Courses**
See Note 12.

**Electives:** see below

**Fall Term**
- Work Term 5

**Winter Term 4B Core Course**
- Geog 490B Senior Honours Research Essay

**Theme Courses**
See Note 12.

**Electives:** see below

**Electives**
Such additional credits as are necessary to ensure that by the time of graduation a student has a minimum of 24 credits.

### Notes on Honours Programme (Regular and Co-op)

#### Note 1
Twenty-four full credits is the minimum requirement for the degree Bachelor of Environmental Studies (Honours Geography - Regular and Co-op). Honours Geography students must therefore ensure that, in addition to the courses required for the degree as outlined above, they take additional courses as electives to average at least six credits per academic year.

#### Note 2
Students are required to take a minimum of eleven credits in Geography. Two of these credits may be courses designated as Environmental Studies (p. 322).
Note 3
Students must take a minimum of five credits in Faculties other than the Faculty of Environmental Studies.

Note 4
To enter Year 2 of the Honours Geography programme, a student must achieve in Year 1 a minimum overall average of B- (70.0) and an average of B (75.0) in Geography and Environmental Studies courses. In subsequent years, a student must continue to achieve an overall average of B- (70.0) and an average of B (75.0) in Geography and Environmental Studies courses.

Note 5
For students wishing to specialize, the Department offers a series of options as detailed below. Students meeting the requirements of an option (which are additional to the core requirements identified above), will have that option designated on their official university transcript.

Note 6
Since many departments doing graduate work in Geography demand proficiency in a foreign language, students intent on graduate work should consider taking at least one credit in a foreign language.

Note 7
Students intending to teach in Secondary Schools are advised to take at least two credits of Regional Geography.

Note 8
This programme prepares students for graduate study in Geography or in Planning, for entry to Secondary School teaching, or for research positions in industry, commerce and government.

Note 9
All Geography students in the regular programme are encouraged to take summer employment which will provide experience useful to a geographer. Where possible, the Environmental Studies Placement Office will provide information and assistance in securing such summer employment. Co-op Geography students will gain appropriate employment experience as part of their degree requirements.

Note 10
For some courses, participating students may be expected to make a financial contribution to defray heavy equipment/travel costs, e.g. Geog 391 (Field Research), which is mandatory for all third year Regular Honours students. Statements on fees, where required, will be found with the course description (p. 341).

Note 11
No more than one and one-half credits may be taken as reading courses in Geography.

Note 12
Co-op students are expected to focus on one or more of the Department's broad areas of specialization which are designated as themes for the Co-op Programme. There are five themes: resource management, economic geography, urban geography, applied physical geography, and techniques. Theme course selections are based on advanced courses offered in the Geography Department and throughout the University. Students must select one of the five themes as a continuing theme of specialization in their own programme of study. Detailed outlines of theme course selections are provided by the co-op advisors at the end of Year 1. By graduation, a student must acquire six and one-half credits in theme courses beyond Year 1, of which three and one-half credits must be in the chosen continuing theme.

HONOURS GEOGRAPHY OPTIONS
The following options represent recognized fields of specialization within the Honours Programmes. Students may elect One option, which will be designated on their transcript upon satisfactory completion of the requirements.

All students must fulfill their regular requirements for the honours degree and are responsible for meeting prerequisite courses. Students electing to graduate with a recognized Geography Option will be required to fill out a Geography Options Schedule at the time they file an Intent to Graduate. Inquiries about any of these options programmes should be directed to the office of the Undergraduate Officer.

Applied Physical Geography Option
Earth 121  Introductory Geology 1
Earth 122  Introductory Geology 2
Biol 250  Ecology
Geog 301  Climatology
Geog 302  Geomorphical Processes
Geog 303  Physical Basis and the Geography of Water
Geog 375  Air Photo Interpretation
Geog 376  Environmental Remote Sensing
Geog/Plan 357  Conservation and Resource Management
Geog 407  Field and Lab Techniques in Geomorphology
Geog 451  Soils Geography
Urban Geography Option
Plan 156 Introduction to Urban and Regional Planning Concepts
Geog 311 Regional Industrial Development
Geog 349 The City as a System 1
Geog 350 Regional Urban Systems 1
Geog 449 The City as a System 2
Geog 450 Regional Urban Systems 2
3 of:
Geog/Plan 307 Social Survey Techniques
Geog/Plan 316 Multivariate Statistics
Geog/Plan 317 Nonparametric Statistics
Geog/Plan 318 Spatial Analysis
Geog/Plan 319 Economic and Social Techniques for Regional Planning

Environmental and Resources Management Option
Env S 195A Introduction to Environmental Studies
or:
Env S 195B Introduction to Environmental Problems
Env S 401 Environmental Law
Env S 444 Land Evaluation and Resources Management

M Env 320 Environmental Economics
Geog 316 Multivariate Statistics
Geog 317 Nonparametric Statistics
Geog 356 Resources Management
Geog/Plan 357 Conservation and Resources Management

Geog 375 Air Photo Interpretation
or:
Geog 376 Environmental Remote Sensing

three of:
Geog 358 Water Planning and Management: Strategies and Experiences
Geog 410 Recreation Geography
Geog 411 Resource Studies
Geog 414 Resources Management Workshop

Regional Geography Option
Students are expected to take one course from the list below in their first year, and 2 courses in each subsequent year. A further 3 courses of selected electives must be selected in consultation with an advisor. These will normally represent either themes and techniques from within Geography relevant to the individual's particular interests, or related studies in disciplines other than Geography. Students concentrating on Canada should consider doing the joint programme Geography with Canadian Studies (see page 167).

The regional courses will be selected from the following list:
Geog 127 Regional Problems of Europe
Geog 125R Introduction to the Third World
Geog 126R Development in the Third World
Geog 225R Urbanization in the Third World
Geog 226R Food and Agriculture, and integrated Rural Development in the Third World
Geog 204 Soviet Union
Geog 205 Africa
Geog 220 World Regional Geography
Geog 221 The United States
Geog 322 Geographical Study of Canada
Geog 323 Comparative Regional Problems
Geog 325R Special Topics in Development of the Third World
Geog 341 Historical Geography of Canada 1
Geog 342 Historical Geography of Canada 2
Geog 421 Europe and the Mediterranean
Geog 422 Canada

Urban and Regional Development Option
Plan 156 Introduction to Urban and Regional Planning Concepts
Geog 311 Regional Industrial Development
Geog 315 Agricultural Geography
Geog/Plan 319 Economic and Social Techniques for Regional Planning
Plan 332 The Sociology of Regions
Geog 350 Regional Urban Systems 1
Plan 358 Regional Planning and Development
Plan 370 Land Development Planning

two of:
Geog/Plan 317 Nonparametric Statistics
Geog/Plan 318 Spatial Analysis
Geog/Plan 316 Multivariate Statistics

Geographical Techniques Option
Env S 272 Computer Programming in Environmental Studies
Geog 360 Preparation of Maps and Illustrations
Geog 375 Air Photo Interpretation
or:
Geog 376 Environmental Remote Sensing
three of:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geog/Plan 307</td>
<td>Social Survey Techniques</td>
</tr>
<tr>
<td>Geog/Plan 316</td>
<td>Multivariate Statistics</td>
</tr>
<tr>
<td>Geog/Plan 317</td>
<td>Nonparametric Statistics</td>
</tr>
<tr>
<td>Geog/Plan 318</td>
<td>Spatial Analysis</td>
</tr>
<tr>
<td>Geog/Plan 319</td>
<td>Economic and Social Techniques for Regional Planning</td>
</tr>
</tbody>
</table>

two of:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geog 403</td>
<td>Advanced Cartography 1</td>
</tr>
<tr>
<td>Geog 404</td>
<td>Advanced Cartography 2</td>
</tr>
<tr>
<td>Geog 470</td>
<td>Applied Air Photo Interpretation</td>
</tr>
<tr>
<td>Geog 471</td>
<td>Advanced Remote Sensing</td>
</tr>
</tbody>
</table>

three of:

Any options not taken from courses listed above or any of:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plan 159</td>
<td>Graphics for Planning</td>
</tr>
<tr>
<td>Arch 212</td>
<td>Computer Science Simulation</td>
</tr>
<tr>
<td>Arch 224</td>
<td>An Introduction to Landscape Design</td>
</tr>
<tr>
<td>Plan 255</td>
<td>Planning Surveys and Analysis</td>
</tr>
<tr>
<td>Env S 252</td>
<td>Media Tools for Environmental Studies</td>
</tr>
<tr>
<td>Env S 253</td>
<td>Media Tools for Environmental Studies (Advanced Level)</td>
</tr>
<tr>
<td>Plan 256</td>
<td>Principles of Environmental Design</td>
</tr>
<tr>
<td>M Env 361</td>
<td>Contemporary Media of Communication and Human Environments</td>
</tr>
<tr>
<td>Geog 407</td>
<td>Field and Lab Techniques in Geomorphology</td>
</tr>
<tr>
<td>M Env 445</td>
<td>Technology Assessment and Policy Analysis</td>
</tr>
</tbody>
</table>

Note: Honours Geography Options

On occasion, certain courses required for an Option programme may not be available to students in their final year. On such occasions, students should consult with the Undergraduate Officer to inquire about permissible modifications to their programmes.

Joint Honours

Joint Honours Programmes have been arranged between Geography and several other disciplines in the University. Detailed programmes have been worked out with Anthropology, Economics, English, French, German, History, Man-Environment Studies, Mathematics, Music, Political Science, Recreation, Russian, and Sociology. The programmes "Geography with Canadian Studies", "Geography with Biology" and "Geography with Earth Sciences" are not Joint Honours Programmes. These programmes lead to degrees in the faculty in which the student is registered, providing always that in addition to the requirements of the specific programme the general requirements of the faculty have been met. For the programmes already approved, depending on the faculty in which the student is registered, the following degrees may be awarded:

BES or BA Joint Geography with:
- Anthropology
- Canadian Studies (see Note 5)
- Economics, English, French
- German, History
- Man-Environment Studies
- Music
- Political Science
- Recreation
- Russian
- Sociology

BES or BA Mathematics or BMath

BES or BSc Earth Sciences Biology

The Department of Geography is prepared to work out other programmes for keenly interested students who meet Honours standards.

Geography core requirements in joint programmes are identical with those of the Geography Honours Regular Programme above, with the exception that where both Departments participating in the programme require specific courses of similar content, a student shall meet that requirement in one Department only. This might be expected to apply in the cases of technique courses, field research and the Senior Honours Essay. Further information concerning Joint Honours Programmes may be obtained from the Undergraduate Officer of the Department.

Geography Course Requirements for Joint Honours Students Registered in Other Departments

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geog 101</td>
<td>Introduction to Human Geography</td>
</tr>
<tr>
<td>Geog 102</td>
<td>Introduction to Physical Geography</td>
</tr>
<tr>
<td>Geog 110</td>
<td>Introduction to the Field of Geography</td>
</tr>
</tbody>
</table>

and one of:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geog 125R</td>
<td>Introduction to the Third World</td>
</tr>
<tr>
<td>Geog 126R</td>
<td>Development in the Third World</td>
</tr>
<tr>
<td>Geog 127</td>
<td>Regional Problems of Europe</td>
</tr>
<tr>
<td>Env S 195A</td>
<td>Introduction to Environmental Studies</td>
</tr>
<tr>
<td>Env S 195B</td>
<td>Introduction to Environmental Problems</td>
</tr>
<tr>
<td>Env S 200</td>
<td>Field Ecology</td>
</tr>
</tbody>
</table>
Geog 201 - Some Basic Topics of Physical Geography
Geog 202 - Some Basic Topics of Economic and Urban Geography
Geog 260 - Introduction to Cartography and Map Analysis
Geog 275 - Introductory Air Photo Analysis and Remote Sensing
Env S 271 - Introduction to Quantitative Research Methods*

*Students taking comparable courses to these in their home departments are not expected to take these courses in Geography.

Notes on Joint Honours Programmes

Note 1
The minimum number of credits in Geography for students registered in another department as Joint Honours is 7.5.

Note 2
Geography students taking Joint Honours with another department must achieve Honours standing as required by the Geography Department (70%, overall, 75% 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 minimum of 75% in Geography and Environmental Studies courses.

Note 3
Students will not normally be accepted into a Joint Honours Programme in Geography before second year.

Note 4
The total number of courses required for a Joint Honours degree is determined by the student's home department. Students doing Joint Honours in Geography are encouraged to take credits beyond the minimal degree requirements.

Note 5
Students choosing the programme Geography with Canadian Studies are referred to the regulations of that programme (p. 124). In addition, the Department of Geography recommends that course selections include the following:

At least three of:
Geog 251 - Cities in Canada
Geog 322 - Geographical Study of Canada
Geog 341 - Historical Geography of Canada 1
Geog 342 - Historical Geography of Canada 2
Geog 411 - Resource Studies
Geog 422 - Canada

At least three of:
Anth 203 - Prehistoric Man in North America
Anth 205 - Anthropology of Race and Racism in Canada
Econ 363 - Contemporary Canadian Problems 1
Plan 222 - Canadian Regional Issues
PSci 260A - Canadian Government and Politics 1
Soc 103 - Canadian Society
M Env 356 - Canadian Non-Renewable Resources
Sci 350 - Canadian Non-Renewable Natural Resources

Geography Minor for Honours Students in Other Departments
The requirements are the same as those noted for the General Geography Programme, i.e., core requirements plus electives to make 6 credits in Geography.

English Language Proficiency Programme
The Faculty of Environmental Studies feels that students enrolled in any of its programmes should be able to demonstrate competency 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 (scheduled during registration week in September). The English Language Proficiency programme is recorded on the student's academic record as Arts 000 Y.
Department of Man-Environment Studies

Nature of the Programme
Man-Environment Studies is a four-year honours degree programme oriented towards study of the many dimensions of human interrelationships with various environments including natural and managed landscapes, buildings and cities, small groups, communities and whole societies. Through problem and issue-oriented enquiry into such complex interrelationships along with related study in the contributory academic disciplines, ample scope is provided for acquiring a broad-based education which recognizes to a degree the need for contemporary "relevance" in the approach and content of higher education.

More important is the educational process sought from a thematic programme such as man-environment studies, which is not artificially constrained by conventional boundaries of academic disciplines. This educational process derives from the recognition that many of the complex interrelated problems of the contemporary world and the future will require attention from people who not only have specialized technical abilities, but who also have the perspective, awareness and understanding necessary to exercise these abilities effectively in cooperation with others and take some measure of responsibility for the human, social and other implications of the results.

The Man-Environment Studies programme does not in itself concentrate on one technical or pre-professional field to meet specifications for particular jobs. However, by investigating a wide range of subjects and problems inherent in the theme of man-environment interrelationships, students obtain a clearer understanding of the range of options open to them for specialized study and can thereby decide more knowledgeably how best to proceed. The programme offers a good base and considerable flexibility from which more specialized qualifications can be sought in a number of related areas through concurrent and, especially, through graduate study.

Graduates holding the BES degree in Man-Environment Studies have found employment in a range of government agencies in fields such as natural resources management, pollution control, social services planning, and urban affairs as well as with private corporate and consulting firms in the communications industry and environmental design; with other universities as full-time teaching or research personnel, and with community agencies in various social programmes and as community organizers. Others who have graduated from Man-Environment Studies have gone on to postgraduate work in programmes 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 unique in having a multidisciplinary 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 programme qualifications in fields such as anthropology, agriculture, biology, chemistry, chemical engineering, communications science, earth sciences, economics, fine arts, geography, mathematics, physics, planning, political science, psychology, sociology and social work, as well as a variety of experience in such diverse areas as the planning of education systems, ecological research, geological investigations, economic studies, urban affairs, technology assessment, and work with various international organizations.

For the approach used in Man-Environment Studies, considerable academic innovation has been necessary. Besides lectures and labs, the programme uses modular instruction units; 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. Although there are no formal arrangements for a co-operative programme in Man-Environment Studies, students are encouraged to relate aspects of their academic programme to summer and other employment or to involvement in community organizations in order to incorporate this experiential learning into a university-based educational process.

For many students a "theme" oriented programme of this kind offers a more satisfying undergraduate education than traditional alternatives. Man-Environment Studies started at Waterloo in 1969 and as an undergraduate degree programme it is unique in Canada although similar ones have become established in the United States, Europe and Australia.

It is recommended that persons desiring more explicit information concerning the programme contact the Undergraduate Officer, Department of Man-Environment Studies, directly.

Bachelor of Environmental Studies
(Honours Man-Environment Studies)
The formal admission requirements of the programme are listed beginning on page 26 of this calendar. No specific Grade 13 courses are required, but some science or mathematics would be helpful.

The Faculty of Environmental Studies expects that students enrolled in any of its programmes 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 Programme is recorded on the student's academic record as Arts 000 Y.

Applicants who have been out of school for a number of years are considered on their work and travel experiences as well as their past academic record.

About one half of the 22 courses required for the BES degree are designated as a core of required courses. The remainder are free electives chosen by each student to develop the mix of subjects and skills best suited for achieving individual educational or career preparation objectives.

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 man-environment studies. Additional course work on research design, methodology, and information or data handling is required and each student also conducts an individual 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 man-environment studies.

The stress given to project-oriented learning within the programme 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 practice skills in problem definition, information and data gathering, analysis and synthesis of material, and presentation of results in a suitable format using the most appropriate communications media. Skills of this nature can be refined, adapted and applied in whatever context or situations students choose during and after their university years. An increasing number of students incorporate work with government 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.

Effective courses can be chosen from anywhere in the university and options start from the first year in the programme. Faculty will advise on this, but essentially there are four broad options as follows:

a) Students may combine Man-Environment 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.

b) Students may concentrate study in an associated field to the extent it becomes a "minor" (typically five credits; consult the "minor" department) within honours Man-Environment Studies. A "minor" can be in any area such as Anthropology, Canadian Studies, Chemistry, Psychology, etc.

c) Students may develop a coherent sequence of courses from electives offered by the Department in combination with courses offered elsewhere to concentrate on one of several possible sub-areas emerging within man-environment studies, i.e. human and community studies, resource and environmental management, or policy and decision-making at the interface of technology and society. See also pages 154-156.

d) Students may choose instead to explore whatever range of subjects interests them in addition to Environmental Studies.

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 different graduate programmes either as absolute prerequisites for them or expressed preferences.

The recommended course load is 6 credits in each of the first two years, and 5 credits in each of the last two years. Each student must have completed twenty-two full credits or the equivalent before graduation with a cumulative overall average of B- (70.0); an average of B (75.0) must be maintained in M-Environ Env 5 courses. There are several evaluation techniques used to determine grades.
The programme is as follows:

**Year 1**
Env S 195A Introduction to Environmental Studies  
M Env 130(F) Environmental Issues 1  
M Env 131(W) Environmental Issues 2  
M Env 150(F) Environmental Methods & Techniques 1  
M Env 151(W) Environmental Methods & Techniques 2  
M Env 190(F) Seminar-Workshop  
M Env 191(W) Seminar-Workshop  
Electives: Two and a half full credits: five half-year courses or equivalent

**Year 2**
Env S 200 Field Ecology  
M Env 241 Social Change, or other half-credit 200 level or above course in one of the social sciences  
Env S 271 Introduction to Quantitative Research Methods, or other introductory methods course approved by the Department (see Undergraduate Officer)  
M Env 290(Y) Seminar-Workshop  
M Env 295(Y) Development of Environmental Thought  
plus electives for a total of 6 credits for the year; 200, 241, 271, and/or 295 may be taken in years other than year 2

**Year 3**
M Env 390(Y) Seminar-Workshop (credit value can be increased to 2 by consent of Faculty)  
Electives: Three or four full credits or equivalent (i.e. six or eight half-year courses)

**Year 4**
M Env 400(Y) Senior Honours Assignment (credit value can be increased to 2 or 3 by consent of Faculty)  
M Env 400(Y) Senior Honours Seminar  
Electives: One to three full credits or equivalent

**Joint Honours**
Joint Honours Programmes have been approved between the Department of Man-Environment Studies and the Departments of Anthropology, Biology, Economics, French, Geography, Germanic and Slavic Languages (for Russian), Mathematics, Philosophy, Political Science, Psychology, Recreation, Religious Studies, and Sociology.

These programmes lead to degrees from the Faculty in which the student is registered. Students from other departments choosing one of these joint programmes must complete the equivalent of seven full courses in Man-Environment Studies. The Department of Man-Environment Studies is prepared to work out other programmes for interested students who meet honours standing.

The Department of Man-Environment Studies is a participating department in the Canadian Studies Programme and in the Peace and Conflict Studies Programme. Concentration in one of these areas can be officially recognized via an "option" designation attached to the BES degree. See the undergraduate officer of the Department and the Directors of the programmes for details.

**School of Urban and Regional Planning**

**Bachelor of Environmental Studies (Honours Urban and Regional Planning Programme)**

**Nature of the Programme**
The emphasis of the programme is on planning as a process, conceived in terms broad enough to include policy-making, research and decision making. The subject focus is regional; that is, the integrated planning of regions, large and small, with both their urban and rural components, including urban-centred or core regions, in which the policy emphasis is on environmental issues and other regional 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.

In order to implement this approach, the School of Urban and Regional Planning has gathered a team of faculty with diverse academic backgrounds and various kinds of planning experience.

The broad educational aim of the School is to prepare the student for active participation in the planning process. This leads to an approach which gives equal emphasis to the 'why' and 'how' of planning. To make this effective, and vital, has required 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 the integration within the programme of selected elements from the discipline of Geography and from other sciences, social sciences 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 programme 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 planning experience into the programme is considered an important part of the education process. Students are expected to gain planning experience during the summer period. The School endeavours to help students find suitable work, particularly between their second and third, and third and fourth years. It is hoped that through the work of the Professional Liaison Officer, the student 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.

Appropriate experience provides the maturing prospective planner with an opportunity for gaining a better understanding of the discipline and allows for the testing of personal interests, learning and aptitudes. In seeking assistance for finding meaningful planning experience, students will be asked to give permission for the release of their marks to employers.

Because of the importance placed upon effective communication, incoming students are expected to have a demonstrated proficiency in English writing skills. All incoming undergraduate planning students are required to take the English Language Proficiency Examination offered by the English Department at the start of the fall term and, if indicated by the examination, to take the appropriate remedial work in addition to normal course and credit requirements. With an increased emphasis in the profession on quantitative analytical techniques, it is highly recommended that students take at least one Grade 13 math course. Students with deficiencies in these areas can elect to take equivalent or remedial courses in their first year of the programme. Students with advanced standing will be considered for admission to Year 2.

Additional Information

The four year Honours programme is recognized by the professional association of planners in Canada (the Canadian Institute of Planners) and an increasing number of employers as a satisfactory preparation for a wide range of careers.

The School of Urban and Regional Planning Undergraduate curriculum is currently undergoing substantial revision. When the new curriculum is published, (at some time before September 1981) it will be effective immediately for all first year students.

Note 1

Students in the Planning School are required to participate fully in all four years of the programme. Students are normally expected to carry a minimum load of six credits in each of those years. However, students interested in taking extra courses are free to take a seven credit load in any given year without approval from the School; preregistration for more than seven credits may only be done with the undergraduate officer's approval. If the student has accumulated more than the required minimum number of credits for proceeding into the next year of the programme (Year 2 - six credits, Year 3 - 12 credits, Year 4 - 18 credits) he/she may elect to reduce his load and will be permitted to take a minimum of 5 credits in any given academic year through Year 4.

All required courses should be taken in the year indicated.

Note 2

It is possible to gain admission to Year 2. To enter Year 2 of the Honours Planning Programme, a student must obtain a minimum overall average of B-(70.0) and a B (73.0) in Planning and Environmental Studies courses and must obtain credit standing in 6 full courses. In subsequent years, a student must maintain a cumulative, overall average of B-(70.0) as well as an average of B (73.0) in Planning and Environmental Studies courses.

Should the student be permitted to continue on the basis of "Conditional due to Average", and, subsequently, if the required averages are not met this second time, withdrawal from the programme is automatic.

Note 3

Planning 156 and Planning 342 and 343 are intended for students in the other disciplines and may not be taken for credit by Planning students.

Continued on page 176.
# Honours Urban and Regional Planning Recommended Programme

<table>
<thead>
<tr>
<th>Year</th>
<th>Required Planning Courses</th>
<th>Required Elective Courses</th>
<th>Elective Planning Courses</th>
<th>Other Electives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1</td>
<td><strong>Plan 100: Introduction to Urban Planning Concepts and Techniques</strong></td>
<td>One-half credit from each of the eight categories in the list of Year 1 Required Elective Courses (see below)</td>
<td><strong>Plan 159: Graphics for Planning</strong></td>
<td>Students may select other electives from any of the University Year 1 offerings—Required and Elective Courses together must total 6 full credits—all courses to be at the first year level.</td>
</tr>
</tbody>
</table>

**Arts 000 Y** (see Note 15) Select those courses which appear to be best suited to your interests and background. (N.B. There are no "best" courses).

Before making a final selection in these courses, students should check that prerequisites have been covered for courses they might wish to take in Year 2, 3 and 4.

---

## Year 1 Required Elective Courses

### Theme Areas

1 **Ecology**
   - Biol 112 or 113 *Introduction to Biology*
   - Geog 102 *Introduction to Physical Geography*
   - Sci 100 *Introduction to the Geology of Canada*

2 **Administration**
   - P Sci 101 *Introduction to Politics 1*
   - P Sci 102 *Introduction to Politics 2*

3 **Design**
   - Arch 142 *Iconography 1*
   - Arch 194 *Visual Interdisciplinary Language*
   - Fine 120 *Fundamentals of Visual Art*
   - Plan 159 *Graphics for Planning*

4 **Habitat**
   - Anth 102A *Introduction to Cultural Anthropology*
   - Env S 195A *Introduction to Environmental Studies*
   - Geog 101 *Introduction to Human Geography*
   - Rec 100 *Introduction to the Study of Leisure and Recreation*

5 **Methodology**
   - Anth 103 *Nature of Language*
   - Anth 104 *Language Learning*
   - Arch 112/113 *Computer Science*
   - CS 116 *Introduction to Computers*
   - CS 117 *Applications and Implications of Computers*
   - Engl 109 *Basic Writing Skills*
   - Fr 101 *Reading French*
   - Engl 150 *English as an Instrument of Thought*
   - Math 105 *Math for Environmental Studies*
   - Phil 140 *Fundamentals of Logic*
   - Sy De 161 *Systems Behaviour*
   - Sy De 162 *Engineering Design Methodology*

6 **Sociology**
   - Soc 101U *Introduction to Sociology*
   - if taught, otherwise Soc 101*

7 **Economics**
   - Econ 101A/101B *Introduction to Modern Economics*

8 **Philosophy**
   - Arts 122G/123G *Quest for Meaning in the 20th Century*
   - Engl 108B *Utopia and Anti-Utopia*
   - Engl 108H *Isolation and Alienation*
   - Hist 101B *Western Civilization*
   - Hist 102D *The Beginnings of the 20th Century*
   - Hist 102F *Western Civilization*
   - Hist 105 *The Meaning of Civilization*
   - Hist 106A *Canadian History*
   - Hist 127 *Canada: Unity in Diversity*
   - Phil 125 *Fundamentals of Social and Political Philosophy*
   - Phil 140 *Fundamentals of Logic*
   - Phil 145 *Critical Thinking*
   - Phil 150 *Knowledge and Reality*
   - Pacs 201 *Peace and Conflict Studies 1*
<table>
<thead>
<tr>
<th>Year</th>
<th>Required Planning Courses</th>
<th>Required Elective Courses</th>
<th>Elective Planning Courses</th>
<th>Other Electives</th>
</tr>
</thead>
</table>
| Year 2 | **Env S 200-Field Ecology**  
- **Plan 256-Principles of Environmental Design**  
- **Env S 271-Introduction to Quantitative Research Methods**  
- **Plan 307-Social Survey Techniques**  
  (Prerequisite: **Env S 271**) and at least 2 of:  
  - **Plan 255-Planning Surveys and Analysis**  
  - **Plan 358-Regional Planning and Development**  
  - **Plan 357-Conservation and Resource Management** | One full credit from list of Required Elective Courses (see following page) | **Plan 222-Canadian Regional Issues**  
- **Plan 230-The Small Group in the Planning Process**  
- **Plan 258-Readings and Research in Planning**  
- **Env S 272-Computer Programming in Environmental Studies** | **Required and Elective Courses together to total 6 full credits**  
List of "Non-Planning Suggested Electives" obtainable from Undergraduate Officer |
| Year 3 | **Plan 300-Seminar/Workshop Project in Urban and Regional Planning**  
- **Plan 307-Social Survey Techniques**  
- **Plan 391-Field Research Methods and Projects** | Two full credits from list of Required Elective Courses (see following page) | **Geog 352-Rural Urban Fringe of Canadian Cities**  
- **Plan 301-Planning Design**  
- **Plan 316-Multivariate Statistics**  
- **Plan 317-Nonparametric Statistics**  
- **Plan 318-Spatial Analysis**  
- **Plan 319-Economic and Social Techniques for Regional Planning**  
- **Plan 330-Urban Social Planning**  
- **Plan 332-The Sociology of Regions**  
- **Plan 333-The Sociology of Regional Planning**  
- **Plan 344-Principles of Recreational Planning**  
- **Plan 360-Technology in Urban and Regional Planning**  
- **Plan 370-Land Development Planning** | **Required and Elective Courses together to total 6 full credits**  
List of "Non-Planning Suggested Electives" obtainable from Undergraduate Officer |
| Year 4 | **Plan 456-Political and Administrative Processes in Urban and Regional Planning**  
- **Plan 480-The Philosophy and Methodology of Urban and Regional Planning**  
- **Plan 490-Senior Honours Essay (2 full course credits)** | One full credit from list of Required Elective Courses (see following page) | **Env S 401-Environmental Law**  
- **Env S 402-Planning Law**  
- **Plan 414-Housing Policies**  
- **Plan 430-Social Policy Planning**  
- **Plan 431-Citizen Involvement, Planning and Social Change**  
- **Plan 470-Concepts and Ideas in Contemporary Urban Planning**  
- **Plan 475-Projects, Problems and Readings in Planning**  
- **Plan 476-Projects, Problems and Readings in Planning** | **Required and Elective Courses together to total 6 full credits**  
List of "Non-Planning Suggested Electives" obtainable from Undergraduate Officer |
Year 2-4 Required Elective Courses

<table>
<thead>
<tr>
<th>Urban Theme</th>
<th>Regional Theme</th>
<th>Resource Theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>These courses are subject to availability</td>
<td>These courses are subject to availability</td>
<td>These courses are subject to availability</td>
</tr>
</tbody>
</table>

**Year 2**

<table>
<thead>
<tr>
<th>Plan 230 The Small Group in the Planning Process</th>
<th>Env S 272 Computer Programming in Environmental Studies</th>
<th>Anth 241 Urban Anthropology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geog 201 Some Basic Topics of Physical Geography</td>
<td>Geog 202 Some Basic Topics of Economic and Urban Geography</td>
<td>Hist 204C Canadian Urban History</td>
</tr>
<tr>
<td>Hist 265B Canadian History 2</td>
<td>P Sci 260 Canadian Government and Politics</td>
<td>Soc 240 Collective Behaviour</td>
</tr>
<tr>
<td>Soc 241 Social Movements</td>
<td>Geog 225R Urbanization in The Third World</td>
<td>Plan 258 Readings and Research in Planning</td>
</tr>
</tbody>
</table>

**Year 3**

<table>
<thead>
<tr>
<th>Plan 301 Planning Design</th>
<th>Plan 330 Urban Social Planning</th>
<th>Plan 360 Technology in Urban and Regional Planning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plan 370 Land Development Planning</td>
<td>Civ E 342 Urban Transport Planning 1</td>
<td>Econ 343 Urban Economics</td>
</tr>
<tr>
<td>Civ 391 Environmental Engineering</td>
<td>Geog 350 Regional Urban Systems 1</td>
<td>P Sci 343 Urban Politics 1</td>
</tr>
<tr>
<td>P Sci 344 Urban Politics 2</td>
<td>Soc 301 Urban Sociology</td>
<td>Geog 349 The City as a System 1</td>
</tr>
<tr>
<td>Geog 350 Regional Urban Systems 1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Year 4**

<table>
<thead>
<tr>
<th>Plan 414 Housing Policies</th>
<th>Plan 430 Social Policy Planning</th>
<th>Env S 401 Environmental Law</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plan 470 Concepts and Ideas in Contemporary Urban Planning</td>
<td>Env S 402 Planning Law</td>
<td>Geog 412 Industrial Geography</td>
</tr>
<tr>
<td>Env S 401 Environmental Law</td>
<td>Geog 422 Canada</td>
<td>Geog 452 Problems of Rural Land Use</td>
</tr>
<tr>
<td>Geog 450 Regional Urban Systems</td>
<td>Civ E 543 Land Use Models</td>
<td>Civ E 543 Land Use Models</td>
</tr>
<tr>
<td>Arch 554 Development and Financing</td>
<td>Geog 449 The City as a System 2</td>
<td>Plan 454 Professional Practise in Planning</td>
</tr>
<tr>
<td>Plan 449 Canadian Urban and Regional Planning: (Part 1)</td>
<td>Plan 450 Canadian Urban and Regional Planning: (Part 2)</td>
<td>Year 4</td>
</tr>
<tr>
<td>Plan 454 Professional Practise in Planning</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Year 2**

<table>
<thead>
<tr>
<th>Plan 222 Canadian Regional Issues Planning Process</th>
<th>Env S 272 Computer Programming in Environmental Studies</th>
<th>Geog 201 Some Basic Topics of Physical Geography</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geog 202 Some Basic Topics of Economic and Urban Geography</td>
<td>Hist 204C Canadian Urban History</td>
<td>P Sci 260 Canadian Government and Politics</td>
</tr>
<tr>
<td>Plan 222 Canadian Regional Issues Planning Process</td>
<td>Soc 240 Collective Behaviour</td>
<td>Geog 201 Introduction to Environmental and Planning Law</td>
</tr>
<tr>
<td>Env S 272 Computer Programming in Environmental Studies</td>
<td>Geog 202 Some Basic Topics of Economic and Urban Geography</td>
<td>Geog 275 Introductory Air Photo Analysis and Remote Sensing</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Plan 332 The Sociology of Regions</th>
<th>Plan 333 The Sociology of Regional Planning</th>
<th>Plan 333 The Sociology of Regional Planning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plan 334 Principles of Recreation Planning</td>
<td>Plan 360 Technology in Urban and Regional Planning</td>
<td>Civ E 343 Transportation Engineering</td>
</tr>
<tr>
<td>Econ 335 Economic Development</td>
<td>Geog 350 Regional Urban Systems 1</td>
<td>Econ 335 Economic Development</td>
</tr>
<tr>
<td>Geog 300 Geomorphology and the Southern Ontario Environment</td>
<td>Geog 350 Regional Urban Systems 2</td>
<td>Geog 350 Regional Urban Systems 1</td>
</tr>
<tr>
<td>Geog 301 Climatology</td>
<td>Geog 315 Agricultural Geography</td>
<td>Geog 352 Rural-Urban Fringe of Canadian Cities</td>
</tr>
<tr>
<td>Geog 356 Resources Management</td>
<td>Rec 302 Travel and Tourism</td>
<td>Rec 334 Park Management</td>
</tr>
</tbody>
</table>

**Year 4**

<table>
<thead>
<tr>
<th>Plan 430 Social Policy Planning</th>
<th>Env S 401 Environmental Law</th>
<th>Env S 402 Planning Law</th>
</tr>
</thead>
<tbody>
<tr>
<td>Env S 444 Land Evaluation and Resource Management</td>
<td>Geog 408 Special Topics in Climatology and Natural Hazards</td>
<td>Geog 410 Recreation Geography</td>
</tr>
<tr>
<td>Geog 411 Resources Studies</td>
<td>Geog 414 Resources Management Workshop</td>
<td>M Env 410 Honours Seminar</td>
</tr>
<tr>
<td>Rec 410 Planning of Recreation Facilities</td>
<td>Rec 434 Advanced Park Management</td>
<td>Plan 454 Professional Practise in Planning</td>
</tr>
</tbody>
</table>
Note 4
No more than 8 first year level credits will be allowed toward the 24-1/2 required to graduate. The number of electives from the required list in each of the 4 years apply not merely to each year in question. For example, a student in Year 4 can also pick from the required list in Year 2 and 3 so long as the total required electives in all 4 years at graduation meet the minimum number (and is within the 8 credit guideline for Year 1 level courses).

Note 5
Students in Year 1 and 2 should be aware of prerequisites in other departments, where Year 1 courses are needed in order to be able to take more advanced courses later.

Note 6
A student wishing to register for a readings and research course (Planning 258, 475 and 476) must first make arrangements with a faculty member to provide the necessary supervision and guidance.

Note 7
Plan 307 may be taken in Year 2 or Year 3 provided that the Env S 271 prerequisite has been met.

Note 8
Students selecting the Quantitative Methods elective in the fourth year are required to select Planning 319, and, if they wish, any of Planning 316, 317, 318.

Note 9
Not all the courses listed herein are offered each year. Students should consult the School prior to registration.

Note 10
The number of hours of lectures shown after the course description is an attempt to indicate the "normal"; each instructor determines how often his particular class will meet.

Note 11
For some courses, participating students may be expected to make a small financial contribution to defray materials/travel costs, e.g. Plan 159 (Graphics for Planning), Plan 300 (Seminar/Workshop Project in Urban and Regional Planning), Plan 357 (Conservation and Resource Management), Plan 391 (Field Research Methods and Projects).

Note 12
Where a student selects 2 of: 255, 358 and 357 and then picks up the third option – that third course will be considered as one of the additional elective planning courses required in either Year 2 or 3.

Note 13
Leave of absence may be negotiated with the approval of the undergraduate officer.

Note 14
A variety of items are covered in the Undergraduate Affairs Policy Manual available from the undergraduate officer. Policy areas covered include: Admission, Courses, Examination, Records and Transfers, Registration, Appeals and Discipline, Academic Standing and Senior Honours Essay. Students are expected to refer to this manual in all matters concerning academic conduct.

Note 15
Arts 000 is not a credit course. This course registers students in the English Language Proficiency Examination (ELPE) which must be taken by all students entering the programme, whether as first year students or by transfer from another programme. Transfer students from the University of Waterloo who have already achieved an ELPE score of 50% need not register for the test.
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 (1966-1967) and the School of Physical Education and Recreation (1968-72). Within this Faculty, the Department of Health Studies, the Department of Kinesiology, the Department of Recreation, and the Dance Group offer academic programmes and conduct research, whereas the Department of Athletics administers intercollegiate and intramural athletics and a service programme in physical activity for all students, faculty and staff.

The programmes of the Faculty have developed rapidly in response to student needs and interests and to the changing needs and demands of society. Eight years ago a regular stream was added to the co-operative programme to enable students who wanted the programmes, 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 an area of Kinesiology, Dance, Health Studies or Recreation in which they had a special interest. The future promises even greater opportunities for specialized study by the individual students.

Dance Programme

The programmes in Dance offer students the unique opportunity of studying dance from the perspectives of the humanities, the social sciences, and the biological 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 programmes 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 Programme

Health Studies is a four-year university honours programme leading to the Bachelor of Science (BSc) degree. Students in the programme study 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 preventive 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, naturopathic medicine, and related fields.

Kinesiology Programme

The Kinesiology programme at Waterloo examines the hows and Whys of human physical activity through a unique blend of theoretical, laboratory, and practical courses and experiences. How is one able to learn and perform the intricate and controlled movements demanded of sportspersons, musicians or users of prosthetics? What are the psychological and social implications of physical activity? In seeking and learning the answers to such questions, the student becomes well equipped to enter any of a variety of exciting and challenging careers such as exercise therapy, rehabilitative medicine, equipment design, gerokinesiatrics (exercise therapy for the elderly) coaching, lab technology, graduate studies and as well, the more traditional field of teaching.

Recreation Programme

The academic programme in Recreation has been designed to give each graduate the body of knowledge necessary to prepare for a professional position in the field of Recreation. Students completing the Honours Degree Programme can, in addition, complete course sequences resulting in a specialization in Recreation Administration, Therapeutic Recreation Services, Outdoor Recreation, or Leisure Studies. Joint Honours Programmes are available with Kinesiology, Geography, Man-Environment Studies and Sociology. A Recreation-Business Option with Wilfrid Laurier University is also offered. Graduates of the Recreation Degree Programme are found in diverse settings, including hospitals, private agencies, municipalities, schools, national and provincial parks, youth agencies, and university graduate programmes.

Degrees

Health Studies graduates receive an Honours Bachelor of Science degree. Graduates of all Kinesiology programmes will receive either an Honours or General Bachelor of Science degree in Kinesiology. Recreation programme graduates are awarded an Honours Bachelor of Arts degree in Recreation. Those students who graduate from the Dance programme will receive an Honours Bachelor of Science degree in Dance, an Honours Bachelor of Arts Degree or a General Bachelor of Arts Degree.

Graduates who have pursued their studies in a co-operative programme and who have successfully completed 4 work terms, 4 work reports, and who
Indeed do finish the co-operative programme, will have the words "Co-operative Programme" added to their University diploma.

**Systems of Study**

**Co-operative System**
The co-operative system is one whereby after the first eight month academic year the student alternates four-month terms in academic study and related work experiences.

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 programme.

**Regular System**
In regular programmes students attend school for two consecutive four month terms each year for three or four years.

**Admission**
The admission requirements and procedures for all programmes are outlined in detail in Chapter 2 of this Calendar. The following points emphasize some of the admission requirements which relate specifically to programmes in the Faculty of Human Kinetics and Leisure Studies.

**Application from Ontario Grade 13**
Applicants to any of the Kinesiology programmes are required to select a Grade 13 programme which includes four or more of the following courses: Biology, Chemistry, Physics, Functions and Relations, Algebra, Calculus.

Applicants to the Health Studies programme should include Grade 13 Biology and Chemistry in their programme.

Applicants to the Recreation programme are required to include a Grade 13 Mathematics course in their programme.

**Advanced Standing**
It is not unusual for students transferring to HKLS programmes to be granted credit for courses taken elsewhere 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.

One term of advanced work experience standing may be granted to students transferring into third year of co-operative programmes in HKLS. Details are available in the Department of Co-ordination and Placement.

**English Language Proficiency Programme**
The Faculty of Human Kinetics and Leisure Studies feels that a student in any of their programmes should be able to demonstrate competency in writing. Therefore, all students entering an HKLS programme must write the English Language Proficiency Examination (scheduled during registration week). Students may demonstrate their competence in writing by achieving a mark of 50% on this examination or by successfully completing the assignments of the University of Waterloo Writing Clinic or by achieving a passing grade in English 109.

**Examinations and Standings**
The Faculty of Human Kinetics and Leisure Studies currently operates under a "course system" in which student progress is measured by courses successfully completed rather than by years. Students who have passed fewer than 10 term courses will be considered Year 1; those who have passed at least 10 term courses but fewer than 21 will be considered Year 2; those with at least 21 but fewer than 32, Year 3; and those with 32 or more, Year 4.

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 Dean for Undergraduate Affairs within one month of publication of the official mark reports. Additional regulations concerning examinations may be found in Chapter 1.

2) Standing
a) The Faculty has endorsed the letter grade system outlined in Chapter 1 of this calendar.
b) Overall standing will be determined at the end of each year for regular programmes and upon completion of the B term for co-operative programmes by the cumulative average of all courses taken at the University while enrolled in the Faculty (whether passed or failed).

The following cumulative averages are required to proceed in the programmes of the Faculty:

<table>
<thead>
<tr>
<th>Programme</th>
<th>Overall</th>
<th>Major Field</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kinesiology Honours</td>
<td>C</td>
<td>C+</td>
</tr>
<tr>
<td>Health Studies Honours</td>
<td>C</td>
<td>C+</td>
</tr>
<tr>
<td>Kinesiology General</td>
<td>D</td>
<td>C-</td>
</tr>
<tr>
<td>Recreation Honours</td>
<td>C-</td>
<td>B-</td>
</tr>
<tr>
<td>Dance Honours</td>
<td>C-</td>
<td>C+</td>
</tr>
<tr>
<td>Dance General</td>
<td>C-</td>
<td>C</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 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 Programme". (The designation F takes into account all failing grades, i.e. F-, F, and F+). If a student clears his/her F, INC and DNW grades prior to his/her next registration, the decision on his/her grade report may be changed.

Students who are required to withdraw may be eligible to apply for readmission only after one year absence. It is recommended that during this absence students do some academic work (extension, correspondence, or community college study) in order to demonstrate that they should be readmitted.

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 regulations constitutes an academic offence.

Programme selection
Full-time students: All first year students normally take 5 term courses in both Fall and Winter terms. In subsequent terms, a student will normally take at least 5 term courses.

Part-time studies or reduced programmes: Except in exceptional circumstances, an Honours programme may not be taken on a completely part-time or reduced programme basis. All undergraduate honours degree programmes in the Faculty of Human Kinetics and Leisure Studies must be successfully completed within 8 calendar years from the time the student first enters the programme. Students may complete a segment of their programme on a part-time basis but must successfully complete a minimum of 22 term courses while enrolled in full-time study (i.e., minimum of 5 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 programme must be completed in 7 years and in the case of students who have been granted the equivalent of two years of advanced standing, the HKLS programme must be completed in 6 years. The Faculty of Human Kinetics and Leisure Studies does not encourage part-time studies but will allow General degree to be pursued on a part-time or reduced-programme basis subject to approval by the Associate Dean of Undergraduate Affairs and the Department concerned. Normally, no first year programme for a full-time student may be reduced below the 10 courses minimum except in very exceptional circumstances.

Course and Programme Changes
a) Up to the end of the first three weeks of lectures, the student may drop or add any course without approval, provided he or she does not predetermine a section.
b) After the first three 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 the date which is 8 weeks from the beginning of lectures.
Academic Programmes

Dance

The unique Dance Programme at the University of Waterloo enables students to pursue Dance as an entire field of both academic and applied study. The two major perspectives of Dance offered through the Bachelor of Arts Degree and the Bachelor of Science Degree Programmes are Dance as a Theatre Art (encompassing Western and non-Western cultures and practices) and Dance as a Movement Science.

To provide the necessary knowledges for varying career interests, three different degree programmes are offered: the Honours Bachelor of Science, the Honours Bachelor of Arts and the General Bachelor of Arts. The Honours Degree Programmes comprise four years of study with the opportunity to specialize in a particular area of Dance in the fourth year through a major research project, special seminars and workshops. The General Degree Programme comprises three years of study and is designed for students who are interested in acquiring an overall knowledge of the subject of Dance. Upon entrance, students are required to enrol in a particular Degree Programme. However, after participating in an introductory First Year which is designed to familiarize them with the various capacities and applications of the discipline of Dance, students may alter their course of study accordingly.

Course Requirements

To be eligible for the Honours BSc degree or the Honours BA degree in Dance, students must successfully complete 44 term courses, and maintain an overall cumulative average of 60% 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 Science Degree Programme
A) Required Dance Courses (14)

<table>
<thead>
<tr>
<th>Course</th>
<th>Term</th>
<th>Course</th>
<th>Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dance 110</td>
<td>Dance 111</td>
<td>Music 150G</td>
<td>Music 151G</td>
</tr>
<tr>
<td>Math 106</td>
<td>CS 118</td>
<td>Kin 102</td>
<td>Soc 101 or Anth 102A</td>
</tr>
<tr>
<td>Psych 101</td>
<td>elective</td>
<td>elective</td>
<td></td>
</tr>
</tbody>
</table>

B) Required Outside Courses (9)

<table>
<thead>
<tr>
<th>Course</th>
<th>Term</th>
<th>Course</th>
<th>Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biol 230</td>
<td>Biol 233</td>
<td>Kin 200</td>
<td>Phys 103</td>
</tr>
<tr>
<td>Kin 222</td>
<td>Kin 255</td>
<td>Dance 241 or 242</td>
<td>Dance 341 or 342</td>
</tr>
<tr>
<td>elective</td>
<td>elective</td>
<td>one of Dance 220, 221, 225</td>
<td></td>
</tr>
<tr>
<td>elective</td>
<td>elective</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

C) Required Kinesiology Courses (10)

<table>
<thead>
<tr>
<th>Course</th>
<th>Term</th>
<th>Course</th>
<th>Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kin 102</td>
<td>200</td>
<td>222</td>
<td>255</td>
</tr>
<tr>
<td>300</td>
<td>321</td>
<td>330</td>
<td>Plus 3 additional courses in the bio-physical area of Kinesiology.</td>
</tr>
</tbody>
</table>

Suggested Course Sequences

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dance 110</td>
<td>Dance 111</td>
<td>Music 150G</td>
<td>Music 151G</td>
</tr>
<tr>
<td>Math 106</td>
<td>CS 118</td>
<td>Kin 102</td>
<td>Soc 101 or Anth 102A</td>
</tr>
<tr>
<td>Psych 101</td>
<td>elective</td>
<td>elective</td>
<td></td>
</tr>
<tr>
<td>elective</td>
<td>elective</td>
<td>Biol 230</td>
<td>Biol 233</td>
</tr>
<tr>
<td>Kin 200</td>
<td>Phys 103</td>
<td>Kin 222</td>
<td>Kin 255</td>
</tr>
<tr>
<td>Dance 241 or 242</td>
<td>Dance 341 or 342</td>
<td>elective</td>
<td>one of Dance 220, 221, 225</td>
</tr>
<tr>
<td>elective</td>
<td>elective</td>
<td>Kin 300</td>
<td>Kin 321</td>
</tr>
<tr>
<td>elective</td>
<td>elective</td>
<td>Dance 364</td>
<td>one of Dance 220, 221, 225</td>
</tr>
<tr>
<td>elective</td>
<td>elective</td>
<td>Dance 346</td>
<td></td>
</tr>
<tr>
<td>elective</td>
<td>elective</td>
<td>elective</td>
<td></td>
</tr>
<tr>
<td>Dance 410</td>
<td>Dance 411</td>
<td>Dance 412</td>
<td>Dance 437</td>
</tr>
<tr>
<td>elective</td>
<td>elective</td>
<td>elective</td>
<td></td>
</tr>
<tr>
<td>elective</td>
<td>elective</td>
<td>elective</td>
<td></td>
</tr>
</tbody>
</table>

Honours Bachelor of Arts Degree Programme
A) Required Dance Courses (10)

<table>
<thead>
<tr>
<th>Course</th>
<th>Term</th>
<th>Course</th>
<th>Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dance 110, 111, 336, 410, 411, 412</td>
<td>Two of Dance 220, 221, 225</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Two of Dance 230, 231, 233</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Two of Dance 241, 242, 341, 342</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

B) Required Outside Courses (10)

<table>
<thead>
<tr>
<th>Course</th>
<th>Term</th>
<th>Course</th>
<th>Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hist 105; Music 150G, 151G; Psych 101; Anth 102A or Soc 101; Kin 200; two term courses from Drama and/or Fine Arts and the equivalent of one full language course or two of Dance 241, 242, 341, 342.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dance Electives (8)</td>
<td>Eight term courses in Dance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D) Other Electives (16)</td>
<td>At least eight of the 16 term course electives must be taken within the Faculty of Arts.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Suggested Course Sequences

Year 1
- Dance 110
- Music 150G
- Psych 101
- Drama 101 or Fine Arts
- Dance elective
- Elective

Year 2
- Dance 230
- Kin 200
- Dance 241 or 242
- Dance elective
- Elective

Year 3
- Dance 336
- Elective
- Elective

Year 4
- Dance 410
- Elective

Technique Courses
Technique is a highly valuable tool for students in all areas of dance. Ballet, Modern and Jazz 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 are granted .25 credit. Students may apply 2.0 credit in technique courses towards any degree in dance.

Note
Students should plan their programme with a faculty advisor so that courses are elected in the appropriate sequence.

General Bachelor of Arts Degree Programme
A) Required Dance Courses (7)
- Dance 110, 111, 336
- Two of Dance 220, 221, 225
- Two of Dance 230, 231, 233
B) Required Outside Courses (9)
- Hist 105; Music 150G, 151G; Psych 101; Anth 102A or Soc 101; two term courses from Drama and/or Fine Arts and the equivalent of one full language course or two of Dance 241, 242, 341, 342.
C) Dance Electives (6)
- Six term courses in Dance
D) Other Electives (8)
- Of the eight term course electives at least 4 must be taken within the Faculty of Arts.

Suggested Course Sequences

Year 1
- Dance 110
- Music 150G
- Psych 101
- Dance elective
- Elective

Year 2
- Dance 230
- Elective
- Drama or Fine Arts
- Dance 241 or 242
- Elective

Year 3
- Dance 336
- Elective

Year 4
- Dance 410
- Elective

Human Kinetics and Leisure Studies
Dance
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, anatomy, 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 Programme, 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

a) Required Health Studies Courses: (14)
b) Required Kinesiology Courses: (6)
   Kin 116, 200, 222, 317, 330
c) Required Courses from other departments: (6)
   Biol 230, 233, 239
   CS 316
   Psych 101; Soc 101
d) Restricted electives: (4)
   One of: Helth 407, 410
   One of: Phil 226, 258 (recommended for Year 4)
   Two of: Biol 211, 240, 241, 340, 451, Helth 302, 303
e) Free electives:
   Fifteen (15) term courses selected in consultation with the student’s advisor.

Course Sequence

<table>
<thead>
<tr>
<th>Year 1 (Co-op and Regular)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Helth 140 or 141</td>
<td></td>
<td>Helth 141 or 140</td>
</tr>
<tr>
<td>Psych 101</td>
<td></td>
<td>Soc 101</td>
</tr>
<tr>
<td>Biol 230</td>
<td></td>
<td>Biol 233</td>
</tr>
<tr>
<td>2 electives</td>
<td></td>
<td>Kin 116</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 elective</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 2</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Helth 245</td>
<td></td>
<td>Helth 241</td>
</tr>
<tr>
<td>Kin 200, 222, 317</td>
<td></td>
<td>Helth 346</td>
</tr>
<tr>
<td>1 elective</td>
<td></td>
<td>Kin 330</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Biol 239</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 electives</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 3</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Helth 340</td>
<td></td>
<td>Helth 344</td>
</tr>
<tr>
<td>Helth 349</td>
<td></td>
<td>Helth 348</td>
</tr>
<tr>
<td>4 electives</td>
<td></td>
<td>4 electives</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 4</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Helth 431</td>
<td></td>
<td>Helth 432</td>
</tr>
<tr>
<td>Helth 442</td>
<td></td>
<td>Helth 443</td>
</tr>
<tr>
<td>4 electives</td>
<td></td>
<td>Helth 445</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 electives</td>
</tr>
</tbody>
</table>

Co-operative Programme

<table>
<thead>
<tr>
<th>Year 2</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2A (Fall)</strong></td>
<td></td>
<td><strong>2B (Spring)</strong></td>
</tr>
<tr>
<td>Helth 245</td>
<td></td>
<td>Helth 346</td>
</tr>
<tr>
<td>Kin 200, 222, 317</td>
<td></td>
<td>Helth 348</td>
</tr>
<tr>
<td>1 elective</td>
<td></td>
<td>Helth 349</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kin 330</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 electives</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 3</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>3A (Winter)</strong></td>
<td></td>
<td><strong>3B (Fall)</strong></td>
</tr>
<tr>
<td>Helth 344</td>
<td></td>
<td>Helth 340</td>
</tr>
<tr>
<td>Helth 241</td>
<td></td>
<td>Helth 442</td>
</tr>
<tr>
<td>Biol 239</td>
<td></td>
<td>4 electives</td>
</tr>
<tr>
<td>3 electives</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 4</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>4A (Spring)</strong></td>
<td></td>
<td><strong>4B (Winter)</strong></td>
</tr>
<tr>
<td>Helth 431</td>
<td></td>
<td>Helth 432</td>
</tr>
<tr>
<td>5 electives</td>
<td></td>
<td>Helth 443</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Helth 445</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 electives</td>
</tr>
</tbody>
</table>
There are significant numbers of students within Human Kinetics and Leisure Studies whose interests potentially encompass both the Kinesiology and Health Studies programmes. The following Joint Honours Programme 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 in Health.

Degree Requirements for Joint Honours include:
A. 44 term courses including –
   - Kinesiology required courses (15):
     - Kin 102, 103, 116*, 200, 222, 252, 255, 300, 317, 321, 330, 335, 354, 431, 432, 470
   - Health Studies required courses (8):
     - Health 140, 141, 241, 245, 348, 349, 442, 445
   - Outside Required (8):
     - Biol 230/233, CS 118 or 316, Math 106 or 107, Phys 103, Phys 105, Psych 101, Soc 101
   - Electives (13)
     - a) Kinesiology – 4 term courses chosen from those electives available in Kinesiology
     - b) Health Studies – 3 of Health 340, 344, 346, 410, 443, 1 of Phil 226, 258
     - c) Free* – 5 term courses chosen from any department within the University
(If Kin 116 is taken, it counts as a free elective)
B. An overall average and major average of 70% is required in the Joint Honours programme.

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 programmes.

Degree Requirements
Honours Programme
Successful completion of 44 term courses is necessary in order to obtain the Honours BSc degree in Kinesiology. The programme must be completed in 8 years.

a) Required Kinesiology courses: (14) Kinesiology 102, 103, 200, 222, 252, 255, 300, 317, 321, 330, 335, 354, 431, 432, 470
b) Required courses from other departments: (8) Physics 103, Physics 105, Biology 230 and 233, Mathematics 106 or 107 (see note), Computer Science 116 or 118 or 316, Psychology 101, and Sociology 101.

Note
In the case of Physics 103 and Mathematics 106 or Mathematics 107 students may elect to take full year courses in either subject in the appropriate department. Mathematics 106 is for students not presenting Grade 13 Calculus. Mathematics 107 is for students who have taken Grade 13 Calculus.

c) Kinesiology Electives: (10) Ten courses from those offered in the Department in addition to the required courses. As part of their Kinesiology elective package, those students who wish to do so may specialize in one of the streams designated by the Department.
(Kin 116 is required for all students not presenting Grade 13 Chemistry for admission. When taken, Kin 116 is counted as a Kinesiology elective.)
d) Electives: Of the remaining twelve (12) term courses, six (6) must be chosen from outside the Department of Kinesiology.

Students should choose electives in consultation with their Faculty advisor.

General Programme
The general degree is offered on a regular basis only and may be taken by part time study.

In order to receive the general BSc degree a student must successfully complete 40 term courses including the following requirements:

A. 44 term courses including –
   - Kinesiology required courses (15):
     - Kin 102, 103, 116*, 200, 222, 252, 255, 300, 317, 321, 330, 335, 354, 431, 432, 470
   - Health Studies required courses (8):
     - Health 140, 141, 241, 245, 348, 349, 442, 445
   - Outside Required (8):
     - Biol 230/233, CS 118 or 316, Math 106 or 107, Phys 103, Phys 105, Psych 101, Soc 101
   - Electives (13)
     - a) Kinesiology – 4 term courses chosen from those electives available in Kinesiology
     - b) Health Studies – 3 of Health 340, 344, 346, 410, 443, 1 of Phil 226, 258
     - c) Free* – 5 term courses chosen from any department within the University
(If Kin 116 is taken, it counts as a free elective)
**Required Kinesiology Courses (11)**
102, 103, 200, 222, 252, 255, 300, 317, 321, 335, 354.

**Required Courses from other departments (8)**

**Kinesiology Electives (9)**
Nine elective courses in Kinesiology.

**Electives (12)**
Of the remaining twelve (12) term courses six (6) must be chosen from outside the Department of Kinesiology.

---

### Course Sequence

**Honours and General Programmes**

**Year 1**

(Common to regular and co-operative programmes)

<table>
<thead>
<tr>
<th>Fall</th>
<th>Winter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kin 102</td>
<td>Kin 116 (if necessary)</td>
</tr>
<tr>
<td>Kin 103</td>
<td>Kin 255</td>
</tr>
<tr>
<td>Biol 230</td>
<td>Biol 233</td>
</tr>
<tr>
<td>Math 106 or 107</td>
<td>Phys 103</td>
</tr>
<tr>
<td>Psych 101</td>
<td>Elective*</td>
</tr>
</tbody>
</table>

* Students may choose a computer science course in place of an Elective in Year 1. If a computer science course is not chosen in Year 1 it must be completed by the end of 3A or 3N.

**Regular Programme**

**Year 2**

<table>
<thead>
<tr>
<th>Fall</th>
<th>Winter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kin 200</td>
<td>Kin 252</td>
</tr>
<tr>
<td>Kin 222</td>
<td>Kin 321</td>
</tr>
<tr>
<td>Soc 101</td>
<td>Kin 335</td>
</tr>
<tr>
<td>Phys 105</td>
<td>Kin 354</td>
</tr>
<tr>
<td>Elective</td>
<td>Elective</td>
</tr>
</tbody>
</table>

**Year 3**

<table>
<thead>
<tr>
<th>Fall</th>
<th>Winter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kin 300</td>
<td>Kin 330†</td>
</tr>
<tr>
<td>Kin 317</td>
<td>5 Electives</td>
</tr>
</tbody>
</table>

4 Electives

**Year 4**

<table>
<thead>
<tr>
<th>Fall</th>
<th>Winter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kin 431 or 433†</td>
<td>Kin 470†</td>
</tr>
</tbody>
</table>

5 Electives 5 Electives

---

**Co-operative Programmes**

<table>
<thead>
<tr>
<th>2A Fall</th>
<th>2B Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kin 200</td>
<td>Kin 252</td>
</tr>
<tr>
<td>Kin 222</td>
<td>Kin 321</td>
</tr>
<tr>
<td>Soc 101</td>
<td>Kin 335</td>
</tr>
<tr>
<td>Phys 105</td>
<td>Kin 330†</td>
</tr>
<tr>
<td>Elective</td>
<td>Kin 354</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3A Winter</th>
<th>3B Fall</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 Electives</td>
<td>Kin 300</td>
</tr>
<tr>
<td>Kin 317</td>
<td>4 Electives</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4A Spring</th>
<th>4B Winter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kin 431 or 433</td>
<td>Kin 470†</td>
</tr>
<tr>
<td>5 Electives</td>
<td>5 Electives</td>
</tr>
</tbody>
</table>

---

**Note**

All students in Year 1 are honours students. †for honours students only.
Department of Recreation

Fourty-four term courses are required for the Honours degree in Recreation. The student begins study in one of the four areas of concentration available in the second year of the programme. Joint Honours programmes with Geography, Man Environment Studies, Sociology and Kinesiology have been developed. A Business Option with Wilfrid Laurier is also offered.

Degree Requirements
A) Recreation courses (22):

1) Required:
   b) Each student normally must include in his programme the five (5) courses listed in one of the following areas of concentration (see note):

   Leisure Studies: Rec 200, 300, 301, 302, 306.
   Therapeutic Recreation: Rec 200, 252, 253, 254, 361.
   Recreation Administration: Rec 312, 316, 320, 334, 410.
   Outdoor Recreation: Rec 316, 332, 334, 432, 434.

2) Recreation Electives:
   Each student must complete additional recreation electives to meet the required total of 22.

B) Courses outside the Department of Recreation

1) Required: (8)
   - Psych 101 and Soc 101
   - Any two of Engl 109, 110, 140, 141, 150, 151, 209, 210
   - Any four of Business 121W, a physical or natural science course, Econ 101, Geog 101/Env S 195, Plan 156 or a course in the Fine or Performing Arts.

2) Non Recreation Electives: (14)

Course Sequence (co-operative and regular)

Year 1
Rec 100, 101, 230, 250
Psych 101
Soc 101
Electives
Two of:
   Engl 109, 110, 140, 141, 150, 151, 209, 210
Four of:
   Business 121
   A physical or natural science course

Human Kinetics and Leisure Studies
Recreation

Econ 101
Geog 101/Env S 195
Plan 156
A course in the Fine or Performing Arts

Year 2
Rec 201, 210, 270
3 Recreation electives
6 electives

Year 3
Rec 371
5 Recreation electives
4 electives

Year 4
Rec 400, 470, 471
3 Recreation electives
4 electives

Honours Recreation and Sociology
Students in the joint honours programme in Recreation and Sociology must successfully complete 44 term courses and must maintain a minimum cumulative average of 70% in their recreation courses, 75% in their sociology courses and 70% overall.

Students must include the following in their programme:

Required Recreation Courses (11)

Required Sociology Courses (5):
Soc 101 Introduction to Sociology
   281 Research Methods 1
   282 Research Methods 2
   405 Sociological Theory
   406 Sociological Theory

Non-Departmental Required Courses (6):
Psych 101 Introductory Psychology
Two of
   Engl 109, 110, 140, 141, 150, 151, 209, 210
Three of:
   Business 121W
   A biological or physical science course
   Econ 101
   Geog 101/Env S 195
   Plan 156
   A course in Fine Arts or Performing Arts

Recreation Electives (9):
Students must elect any nine advanced courses in Recreation.
Sociology Electives (9):
Students must elect any nine advanced courses in Sociology.

Non-Departmental Electives (4):
Students must elect any four courses outside of Recreation or Sociology which relate to their major area of study.

Honours Recreation and Business Option
In this special honours Recreation programme, students take business courses at Wilfrid Laurier University. The 44 term courses in this programme must include:

a) The 22 term courses required of all Recreation students.
b) The 8 outside courses required of all Recreation students.
d) Six (6) Electives.

Honours Recreation and Man-Environment Studies
Students in the joint honours programme in Recreation and Man-Environment Studies must successfully complete 44 term courses and must maintain a minimum average of 70% in their recreation courses, 75% in their Man-Environment courses, and 70% overall.

Students must include the following in their programme:

Required Recreation Courses (8-11)
Rec 100, 101, 201, 210, 230, 250, T270, 371, 400, T470, T471.

Required Man/Environment Courses (13-16)
130/131 Environmental Issues and the Social Sciences
150/151 Environmental Issues Methods and Techniques
190/191 Seminar-Workshops
241 Social Change, or other half-year course in social sciences at the year 2 level
T271 Introduction to Quantitative Research Methods or one other introductory methods course approved by the Department
290(Y) Seminar Workshop
390(Y) Seminar Workshop
T490(Y) Senior Honours Assignment
Env S 200 Field Ecology
Env S T271

T Note
A student may elect to take either Recreation 470-471 or Man Environment 490. Likewise a student may elect Rec 270 or Env S 271.

Recreation Electives (7)
Students must elect seven advanced courses in recreation.

Man Environment Electives (2)
Students must elect one of the Senior honours seminars offered by the Department of Man-Environment Studies.

Non-Departmental Required Courses (7)
- Soc 101 and Psych 101
- Any two of Eng 109, 110, 140, 141, 150, 151, 209, 210
- Any four of Business 121W, a biological or a physical science, Econ 101, Geog 101/Env S 195A, Plan 156, or a course in Fine or Performing Arts.

Honours Recreation and Geography
Students in the joint honours programme in Recreation and Geography must successfully complete 44 term courses and must maintain a minimum cumulative average of 70% in their recreation courses, 75% in their Geography courses and 70% overall.

Students must include the following in their programme:

Required Recreation Courses (8-11)
Rec 100, 101, 201, 210, 230, 250, T270, 371, 400, T470, T471.

Required Geography Courses (14-17)
Geog 101 Introduction to Human Geography
Geog 102 Introduction to Physical Geography
Geog 110 Introduction to the Field of Geography
One of Geog 125R, 126R, 127, Env S 195 A or B
Env S 200 Field Ecology
Geog 201 Some Basic Topics of Physical Geography
Geog 202 Some Basic Topics of Economics and Urban Geography
One of Geog 203, 204, 205, 220, 221.
Geog 260 Introduction to Cartography and Map Analysis
Env S 271 Introduction to Quantitative Research Methods
Geog 275 Introduction to Air Photo Analysis and Remote Sensing
Two of Geog 316, 317, 318.
Geog 381  The Nature of Geography
Geog 390  Senior Honours Essay Research Proposal
(For Students who plan to register in Geog 490)

Geog 490(AB)  Senior Honours Research Essay

T Note
A student may elect to take either Recreation 470-471 or Geography 490, and Recreation 270 or Geography 271.

Recreation Electives (11)
Students must elect eleven advanced courses in recreation.

Non-Departmental Required Courses (7)
- Soc 101 and Psych 101
- Any Three of Business 121W, a biological or physical science course, Econ 101, Plan 156, or a course in Fine or Performing Arts.

Honours Recreation and Kinesiology
Students in the joint honours programme in Recreation and Kinesiology must successfully complete 47 term courses and must maintain a minimum cumulative average of 70% in all their courses.
Students must include the following in their programme:

Recreation Courses (6-11)
Recreation 100, 101, T201, 210, 230, 250, T270, T371, 400, T470, T471.

Required Kinesiology Courses (10-15):
- Kin 102  Biophysical Basis of Kinesiology
- Kin 103  Psycho-Social Basis of Kinesiology
- Kin 200  Human Anatomy of the Limbs and Trunk
- Kin T222  Statistical Techniques Applied to Kinesiology
- Kin T252  Introduction to Sociology of Sport
- Kin 255  Introduction to Psychomotor Behaviour
- Kin 300  Psychology of Physical Activity
- Kin 317  Human Biochemistry
- Kin 321  Introduction to the Biomechanics of Human Movement
- Kin T330  Research Design
- Kin 335  Evaluation of Human Motor Performance
- Kin 354  Social Psychology and Physical Activity
- Kin T431  Research Proposal
- Kin T432  Research Project
- Kin 470  Seminar in Kinesiology

T Note
A student may elect to take either Recreation 470/471 or Kinesiology 431/432, Recreation 270 or Kinesiology 222, Recreation 371 or Kinesiology 330, and Recreation 201 or Kinesiology 252.

Recreation Electives
Students must select a sufficient number of recreation electives to complete a total of eighteen recreation courses.

Kinesiology Electives
Students must select a sufficient number of Kinesiology electives to complete a total of eighteen Kinesiology courses.

Non-Departmental Courses (11)
- (Business 121W and Economics 101) or (Environmental Studies 195B and Planning 156).
A student discussing her programme with her degree committee.
An Opportunity for the Individual to Develop an Independent Programme of Study

Integrated Studies, a small undergraduate programme, was established within the University of Waterloo in 1969 for students who desire to create their own programmes of study. While students may apply their studies toward a baccalaureate degree (it is an option, not a requirement), the Programme's emphasis is to provide individuals with the opportunity to explore their learning interests.

Integrated Studies is distinctive in that the students are encouraged to engage in independent study and to develop a perspective beyond that of a single discipline. At the same time, the daily life of the Programme reflects the broad diversity of the people within it. This community promotes a degree of interaction and sharing seldom found in a university setting, including much spontaneous learning, debates, discussions and plain fun. Finally, the students play the primary role in the operation of the overall programme.

Self Government
The students, in conjunction with the Resource Persons and staff, are responsible for the government of Integrated Studies through their participation in Operations Council. Council normally meets every second week to receive reports and recommendations from its committees, composed of members of the Programme, and to decide on all matters affecting the Programme's operation, with the exception of the BIS degree. Standing committees are concerned with such items as admission of students, budget development, hiring of personnel, student project assistance and year-end reviews.

Through Council, Integrated Studies attempts to foster the students' development by making a wide variety of resources accessible to them. This includes providing financial assistance for individual travel, conference and research expenses, allocating computer time, sponsoring seminars and conferences, and hiring Resource Persons.

Resource Persons
The Programme's Resource Persons serve as tutors and advisors in the students' formulation and pursuit of their studies. As the Resource Persons are normally broadly experienced in inter-disciplinary study, they are able to identify connections among areas of knowledge. From their experience in the University and the community they direct students to specialized areas of expertise or particular facilities to further their study and expand their interests.

The current Resource Persons are:
Ian Angus, Carol Brooks, Madeleine Byrnes, Anne Dagg, Mac Jamieson, Larry Kendall, Hugh Miller.

Approach to Resources
In designing their own studies, the students have access, not only to the Programme'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 Programme. 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 Programme's composition continually foster an enthusiastic exchange of information among the students and the Resource Persons. This activity has promoted a variety of seminars (for example, on change, the psychology of adolescence, women in literature, and evolution), ongoing meetings (for example, the women's and men's groups, and the writers' workshop), and a recent symposium on learning.

Year-End Reviews
Students are encouraged to document the structure and pursuit of their studies as their programmes develop. They are required to report yearly on this development. It is suggested that they indicate the nature of their studies, resources used (personnel, facilities and materials), provide a critical evaluation of their education year indicating particular achievements and difficulties, and perhaps include examples of their work and evaluation by others.

Degree Process
While students may take and receive grades for regular University courses, the degree awarded through this Programme is not based on the accumulation of course credits but on the evidence of competence achieved. The Bachelor of Independent Studies (BIS) degree is at least equivalent to a regular general baccalaureate degree. However, it is neither a three year nor a four year degree. Each degree programme 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 Integrated 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 programmes. 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.

The responsibility students in this Programme must assume for their studies ensures that graduates will possess a high level of organizational skills, self discipline and motivation, combined with their attested educational development. These capabilities have prepared them well for further endeavours and have proven advantageous in their search for employment. Moreover, graduates have been remarkably successful in gaining admission to colleges of education, law, business, medicine, and other professional and graduate programmes.

Current members of the Academic Board are: M. L. Breidenbaugh (Psychology), T. E. Bunting (Geography), G. R. Francis (Man-Environment Studies), R. H. Holmes (Philosophy), S. M. Smith (Biology), D. M. R. Taplin (Mechanical Engineering).

Admission Requirements
Students applying to the Programme 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 Integrated Studies, and
3) an indication of the type of exploration proposed.

Candidates are also encouraged to submit letters of reference assessing their ability to pursue their proposed programmes.

All applicants residing within a reasonable distance of the University are then interviewed by the Admissions Committee consisting of students and Programme staff. Decisions on the remaining applicants are made solely on the submitted material.

While general University standards are applicable to Integrated Studies, applicants who do not have a formal educational background but who do show aptitude for self direction and indicate an ability to flourish in an unstructured academic setting are given favourable consideration.

Those interested in this alternative approach to university education are urged to visit the Programme to meet with those currently involved in its operation. In addition, members of Integrated Studies would be happy to visit schools or groups of students to discuss the Programme.

For further information, including a copy of the current handbook, contact Bill Smyth, Coordinator, at extension 3437 in room 1054 in the Psychology (PAS) building.

Examples of Individual Study
Along with a number of other I.S. students, Marisa was interested in preparing herself for admission to medical school. Rather than continue a traditional science-oriented approach, she decided it was more important to examine aspects of the health care process in a broad cultural context to develop her own health care values. She concentrated on facets of the learning process itself (problem solving, critical analysis, research techniques) using these skills to examine health care through project exercises in such areas as pain, the doctor-patient relationship, and the hospice approach to death and dying.

On entering IS after having completed a regular baccalaureate degree in Manitoba, Jamie pursued his study of man through philosophy and anthropology. He engaged in a weekly tutorial with an IS Resource Person who compiled a reading list introducing him to the sociology of knowledge and assisted his study of phenomenology and contemporary literature. While working occasionally with other Resource Persons he also made contact with faculty in the anthropology and philosophy departments. In order to gain some continuity while becoming accustomed to independent research, he registered in philosophy and history courses. In addition, he participated in a number of IS seminars.

Vivian’s interest in solar energy began in her first term in the Programme but it was not until her second year that it became her major study. Her studies included compiling an annotated bibliography of her readings on active and passive solar energy systems and photovoltaics, attending the 1979 conference of the Solar Energy Society of Canada, Inc. in Prince Edward Island, auditing a course on the design elements of solar architecture, attending the 1980 International Symposium on Solar Energy Utilization in London, Ontario, and helping conduct a survey of solar projects and buildings in the Ottawa region.

Ed’s work on writing and his studies of outlaw legend were featured at our 10th anniversary celebration with the production of the first act of his play “Crocket”. He has participated in the Programme’s Writers’ Group, attended a conference of the Periodical Writers’ Association of Canada, invited James Reaney to present a seminar in IS and received a critique of his writing from him, and worked with Resource People and University faculty.
His studies of the development of legend and the rise of the folk hero led to the writing of a number of essays and articles; some have been published or accepted for publication.

Michael has been able to combine his study of computer science with related work experience within the University's computer systems. Specifically his work has been concerned with the management of small computer systems, from both the software maintenance and administrative aspects. At the present time he has been developing a number of software packages and pursuing minor projects with the assistance of other students, staff and faculty. Another interest which he continues to explore is astronomy, particularly in terms of telescope construction. He recently published an article on optical slits for telescope testing.

Frank's goal was to build on his knowledge of mathematics to use micro-processors for physical machine control. To this end he undertook extensive readings of relevant periodical literature and appropriate senior-level computer science courses to develop his knowledge in data structures, low and high level languages, and compiler theory. His side interests included music theory, science fiction and fencing.

To follow her interests in architecture, fine arts and the environment, Vicky chose a fairly heavy course load to help her re-enter the University after an absence of several years. After her first term she began to focus her studies on Third World development, particularly urban problems, making extensive use of faculty from her courses. In addition, she attended environmental seminars and made use of the International Development Research Centre (IDRC) in Ottawa. She intends to contact international agencies regarding their programmes in community development and squatter improvement projects with the hope of expanding her knowledge by practical experience in Asia.

Deborah was a part-time student in the Faculty of Arts for a number of years before entering Integrated Studies to seek a redefinition of the psychology of women through examining adolescent female development. In addition to courses in biology, human biochemistry, psychopharmacology and neuroendocrinology, she structured her programme to include a study of feminist theory, participation in conferences, an independent research project which required preparing an extensive questionnaire on adolescent attitudes to menarche and menstruation, and volunteer work with adolescent females in the high schools.

Geordie's study of the quality of working life focussed on the following areas: organization theory, sociotechnical systems theory, job and organization design, planned organizational change. He has worked with faculty from this University and York and Queen's Universities in creating a programme which included formal classes, conferences, and directed readings. Finally he has had extensive field placement experience directed toward improving the quality of working life in Canadian companies. He has prepared papers in each of his study areas and a report evaluating his field placement experience.

Working from a background in mathematics and logic, Nimet's initial area of independent study was the formal development of set theory from a basic logical system, propositional calculus. Other studies expanded on courses such as compiling texts based on lectures and notes for intermediate logic and logical theory. She subsequently focussed her studies on the logical writings of Aristotle (notion of logic and syntax used, theory of negation and opposition, categorical and some aspects of modal syllogisms) and those of Bertrand Russell (impact on modern logic with respect to logicism, logic and its relation to mathematics).

After her children had grown up, Giselle decided to use the Programme to consolidate her interest in the life and legends of the Eskimo. She took art, religious studies and anthropology courses on both a credit and audit basis in preparation for an extensive illustrated presentation of Eskimo legends. This project involved a review of Eskimo mythology and a methodical search through early expedition records, mission diaries and major collections, such as those of the Smithsonian Institution, and the Northern Affairs division of the Canadian government.
Prof. B. Forte, Applied Mathematics
Faculty of Mathematics

Prior to 1967, Honours and General Mathematics programmes were offered through the Faculties of Arts and Science. The continued growth and development of these programmes 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 and Statistics (including Actuarial Science). The degree Bachelor of Mathematics (BMath) is awarded upon successful completion of three-year Pass, four-year General and four-year Honours programmes.

Honours and General programmes are available on 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 programme is not available on the co-operative system. Students may also register in regular (not co-operative) programmes through St. Jerome's College.

The Faculty also offers graduate programmes 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.

Brochures

The Faculty of Mathematics publishes a brochure specifically designed for Ontario high school students as well as individual pamphlets describing each of the Faculty's programmes. Copies of these are available in school guidance offices or on request from either the Director of Undergraduate Affairs or the Assistant Registrar, Faculty of Mathematics.

Admission

General Admission requirements and procedures are outlined in detail in Chapter 2. The following policies relate specifically to the Faculty of Mathematics.

Admission as an Adult 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 an adult student. The applicant should have covered the material of the Ontario Grade 13 mathematics courses (Calculus, Functions and Relations, Algebra), either through a local high school or through the Correspondence Branch of the Ontario Ministry of Education, and should provide evidence of being able to profit from a mathematics programme. Each application will be considered on its own merits by the Admissions Committee (See also Part-time Studies).

Advanced Standing

1) Transfer Credits

Students transferring into the Faculty of Mathematics, either from outside or from within the University of Waterloo, 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 mathematics course specifically designated for mathematics students. A transfer failure will normally be assigned if the mark is less than 50%.

A mark of 50-59% in a mathematics course equivalent to a course required for a BMath degree could give the student exemption from that requirement but not a credit toward the degree.

A maximum of twelve 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 twelve elective (non-math) half-credits, with a possibility of exemptions in certain math courses.

Note

Students transferring from other post-secondary institutions or other University of Waterloo faculties require at least twelve University of Waterloo Mathematics half-credits that may be taken for credit by a student in the Faculty of Mathematics.

2) 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 only considered 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.

3) Co-operative Programmes

It is normally not possible to transfer into a co-operative programme beyond the second-year level. Students applying for transfer at the second-year level must 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 programmes 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 programme will be considered automatically for the regular programme.

Part-Time Studies
Students wishing to work toward a degree in Mathematics on a part-time basis must meet the regular admission requirements.

Applicants who do not meet these requirements may be admitted as non-degree, part-time students at the discretion of the Admissions Committee. After completing at least four half-credit Mathematics courses, they may apply for degree candidacy. If regular admission is granted, any credits earned as a non-degree, part-time student will count towards BMath degree requirements.

The BMath Pass degree may be obtained entirely by part-time studies; the BMath General degree requires at least two terms on campus; the BMath Honours degree requires at least four terms on campus.

Mathematics courses are not normally offered in the evenings or on Saturdays, although a reasonable cross-section of elective courses is available in the evenings, particularly during the Fall/Winter sessions. Many part-time students take courses via the University of Waterloo Correspondence Programme. (See Chapter 1 for more details of this programme. A separate brochure is also available.)

Fees, Financial Assistance
See Chapters 3 and 4.

Academic Programmes/
Degree Requirements

General Remarks
The Faculty of Mathematics offers undergraduate programs leading to the following Bachelor of Mathematics degrees: BMath Honours, BMath General, BMath Pass. The Honours Programme is designed for students who wish a heavy concentration of study in some area of the Mathematical Sciences. The General Programme, on the other hand, is more suitable for students with a definite interest in mathematics but who wish to avoid the intense specialization of the Honours Programme. The Pass Programme is a relatively non-specialized course of study intended primarily for students who wish to pursue a more general education and include a larger number of non-Math electives in their programmes. It could also be chosen by those wishing to take a substantial number of mathematics courses but who, for one reason or another, wish to complete their degrees in three years.

Recognizing the diversity of freshman backgrounds, interests and abilities, the Faculty of Mathematics offers its required core courses (not only in Year 1) at three levels of difficulty: Advanced, Honours and General. The advanced level courses are intended for exceptionally gifted students in an Honours programme.

The Honours Programme is more demanding than either the General or Pass Programme. In addition to requiring that the Honours versions of Faculty core courses be taken, the normal course load for an Honours student beyond first year is six compared to five for General and Pass. Further, the BMath Honours degree requires a higher graduating average and a greater degree of specialization than the BMath General and Pass degrees.

The commonality of curriculum (particularly in the first two years) permits considerable flexibility for students to change from one academic programme to another within the Faculty of Mathematics. In fact, if non-mathematics electives are judiciously chosen, this flexibility extends to many programmes in other faculties.

The following tables and accompanying descriptions outline in detail the degree requirements and typical course load for each year (i.e. two four-month academic terms) of all undergraduate programmes in the Faculty of Mathematics. Except where noted, Honours and General programmes may be taken on either the regular or co-operative system of study. The Pass programme is available only in the regular system. The academic requirements of corresponding co-operative and regular programmes are identical.

Additional requirements for co-op students are summarized in booklets entitled ‘Regulations and Procedures for Co-operative Programmes’ and ‘Co-op Math – Handbook for Students in the Co-operative Mathematics Programme – University of Waterloo’. Both publications are available from the Department of Co-ordination and Placement in Needles Hall.

Under the Math Faculty’s credit system, the onus is on the student to be aware of all regulations pertaining to his/her programme 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.
### Table 1 - (a) Degree Requirements

<table>
<thead>
<tr>
<th></th>
<th>Honours Programme</th>
<th>General Programme</th>
<th>Pass Programme</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Minimum Credits</strong></td>
<td>thirty math half-credits; twelve elective half-credits; six elective or math half-credits.</td>
<td>twenty-four math half-credits; twelve elective half-credits; six elective or math half-credits.</td>
<td>twelve math half-credits; eight elective or math half-credits.</td>
</tr>
<tr>
<td><strong>Maximum Math Average</strong></td>
<td>70% on thirty math half-credits</td>
<td>60% on twenty-four math half-credits</td>
<td>60% on twelve math half-credits</td>
</tr>
<tr>
<td><strong>Maximum Course Attempts (or equivalents)</strong></td>
<td>sixty half-credits</td>
<td>fifty-four half-credits</td>
<td>forty-four half credits</td>
</tr>
<tr>
<td><strong>Maximum Failures (or equivalent)</strong></td>
<td>eight half-credits</td>
<td>ten half-credits</td>
<td>ten half-credits</td>
</tr>
<tr>
<td><strong>Minimum Complete Terms Required</strong></td>
<td>four</td>
<td>two</td>
<td>none</td>
</tr>
</tbody>
</table>

#### Footnotes to Table 1 (a)

1. The term 'math half-credit' includes courses with abbreviations 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 'elective half-credit' refers to courses offered by other UW faculties as well as those with the abbreviation MTHEL. A two-term (i.e. eight-month) course is equivalent to two one-term (i.e. four-month) courses.

2. Some Honours programmes require fewer than thirty math half-credits (e.g. Joint Programmes with other faculties, Math/Business Administration, Chartered Accountancy and Management Accounting options). See detailed programme descriptions on the following pages.

3. All Faculty and Departmental courses required for a particular degree will be included in the Math Average. For Honours programmes requiring more than 30 math half-credits (e.g. Double Honours), all such credits will be included in the Math Average. For Honours programmes which require fewer than 30 half-credits only those required credits will be included in the Math average. Also see page 203.

4. There are two deadline dates each term, one for adding courses (this includes changing sections) and a second for dropping courses. The last day to add a course is 2 weeks after the official beginning of lectures. The last day to drop a course is 6 weeks after the official beginning of lectures in the term the course terminates. (These deadline dates apply only to Math Faculty students.)

   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. Further, if a two-term course registration is cancelled after the drop deadline in the first term of the course but before the drop deadline in the second term of the course, the course will be recorded as a half-credit course attempt.

   A course attempt not successfully completed constitutes a course failure. Further, a two-term course registration cancelled between drop deadlines (see 4 above) constitutes an unsuccessfully completed half-credit course attempt, hence a half-credit failure.

5. A complete term (i.e. 4 months) is normally one in which a student successfully completes at least five half-credits on campus, at least two of which must be Mathematics courses. For purposes of satisfying the requirements for a complete term, each term of a two-term course will be regarded as a successfully completed half-credit, provided the student successfully completes the two-term course.

#### English Writing Skills

All BMath degree candidates with an initial registration of Fall/80 or later must satisfy a Writing Skills Requirement, namely:

“A grade of 65 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 Curriculum Committee, to be maintained in the Math Undergraduate Office, OR Four satisfactory Work Reports.”
# Table 1 - (b) Typical Course Loads

<table>
<thead>
<tr>
<th>Year</th>
<th>Honours Programme</th>
<th>General Programme</th>
<th>Pass Programme</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Math 130a/b; Math 134a/b; two of CS 140, 180, 240, 250; six elective half-credits.</td>
<td>Math 120a/b; Math 124a/b; two of CS 140, 180, 240, 250; six elective half-credits.</td>
<td>Math 120a/b; Math 124a/b; two of CS 140, 180, 240, 250; six elective half-credits.</td>
</tr>
<tr>
<td>2</td>
<td>Math 230a/b; Math 234a/b (or 231a/b); Stat 230, 231; two math half-credits; two elective half-credits; two elective or math half-credits.</td>
<td>Math 220a/b; Math 224a/b (or 221a/b); Stat 220/221; two elective half-credits; two elective or math half-credits.</td>
<td>four math half-credits; three elective half-credits; three elective or math half-credits.</td>
</tr>
<tr>
<td>3</td>
<td>eight math half-credits; two elective half-credits; two elective or math half-credits.</td>
<td>six math half-credits; two elective half-credits; two elective or math half-credits.</td>
<td>four math half-credits; three elective half-credits; three elective or math half-credits.</td>
</tr>
<tr>
<td>4</td>
<td>eight math half-credits; two elective half-credits; two elective or math half-credits.</td>
<td>six math half-credits; two elective half-credits; two elective or math half-credits.</td>
<td>not applicable.</td>
</tr>
</tbody>
</table>

### Footnotes to Table 1 (b)

1) Table 1 (b) describes the general framework and core courses applicable to all programmes in the Faculty of Mathematics. Third year core courses, degree requirements and recommendations which are programme dependent are described beginning on page 000.

2) The term ‘math half-credit’ includes courses with abbreviations ACTSC (Actuarial Science), AM (Applied Mathematics), C&O (Combinatorics and Optimization), CG (Computer Science), Math (non-departmental faculty courses), PMath (Pure Mathematics), and Stat (Statistics). The term ‘elective half-credit’ refers to courses offered by other UW faculties as well as those with the abbreviation MTHEL. A two-term (i.e. eight-month) course is equivalent to two one-term (i.e. four-month) courses.

3) Some Honours programmes require fewer than thirty math half-credits (e.g. Joint Programmes with other faculties, Math/Business Administration, Chartered Accountancy and Management Accounting options require 24 math half-credits.) This would typically be accomplished by taking 8 math and 6 non-math half-credits each year (3 and 3 each term). See detailed programme descriptions on the following pages.

4) The Faculty of Mathematics is in the midst of implementing curriculum changes in its Linear and Abstract Algebra core courses. Accordingly, Maths 224a/b, 234a/b, 244a/b have been phased into the Math Faculty's course offerings over the last year. Maths 221a/b; 231a/b, 241a/b have been phased out. Maths 324a/b, 334a/b will be phased in over the next year. Maths 321a/b, 331a/b will be phased out over the same period. Students with at least one half-credit from the sequence of courses to be phased out must continue to choose courses from that sequence. (Students in this category should plan their courses carefully to ensure that all course requirements in the 'old' sequence have been met before the phasing process is complete.) Otherwise, courses must be chosen from the new sequence. Under no circumstances, without written Faculty approval, should students mix courses from the old and new sequences.

Maths 321a, 331a will probably be offered for the last time in spring/81. Maths 321b, 331b will probably be offered for the last time in winter/82.

Maths 324a/b, 334a/b will be offered for the first time in 1981/82.

5) Some flexibility exists to permit the scheduling of courses in a different manner than that shown in Table 1 (b) provided that course pre-requisites have been met. In certain cases, substitutions among corresponding Advanced, Honours, and General level courses may be made in the Faculty core. More details are given on pages 210 and 377.
Departmental Honours Programmes: Requirements and Recommendations

Except where noted, Honours programmes may be taken on either the regular or co-operative system of study.

Actuarial Science

The Department of Statistics offers courses and programmes in Actuarial Science, which is the application of mathematics and statistics to financial problems with particular emphasis on Life Insurance and Employee Benefit Programmes. The courses offered provide theoretical preparation for the first five examinations of the Society of Actuaries, and include studies of such subject areas as Mathematics of Finance, Life Contingencies, Theory of Risks, and Demography.

Students can also gain valuable background knowledge in economics, finance, administration, and law by carefully selecting their electives.

Honours Actuarial Science

Faculty core requirements as outlined in Table 1(b) and:
(Math 334a, 334b or PMath 344) or (Math 331a/b or PMath 341 a/b);
Math 332b or PMath 352a;
One of Math 332a, CS 370, 371, PMath 351a;
ACTSC 231, 232, 331, 332, 431, 432, 433;
Two of ACTSC 337, 338, 391, 435, 441, 451, 452, 453, 454, 491, 492;
A total of at least sixteen 300 or 400 level math half-credits, at least eight of which are at the 400 level.
MTHEL 305a/b is recommended for co-op students in Year 1 and for regular students in Year 1 or 2.

Honours students in another department in the Faculty of Mathematics wishing a “double major” or a “minor” in Actuarial Science should consult the section “Combination Honours Programmes Within the Faculty of Mathematics” which begins on page 202.

Applied Mathematics

Traditionally, Applied Mathematics has been almost synonymous with Mathematical Physics but times change and today Applied Mathematics, while retaining its interest in the physical sciences, is broadening its scope and is becoming concerned with the applications of mathematics to the social and biological sciences. To handle the types of problems that arise in these areas the Applied Mathematician requires two things: a firm background in mathematics with a mastery of techniques and an ability to understand a problem when that problem is stated in the language of biology, economics, engineering, chemistry, physics or business.

With these considerations in mind, the Honours Applied Mathematics programme has been developed as follows. In the first two years the student takes essentially the same programme as every other Mathematics student and acquires a basic mathematical background. In year three he/she studies the mathematics needed by an applied mathematician. In the fourth year, in addition to broadening his/her mathematical background, the student can apply his/her acquired mathematical skills to problems in various fields such as: Fluid Mechanics, Differential Equations, Quantum Mechanics and General Relativity.

It is our belief that a graduate from this programme will be able to turn his hand to many things such as meteorology, oceanography, seismic exploration, supersonic flow, the problems of navigation in space, control problems, ecological population studies and the study of epidemics.

The Applied Mathematics Department offers only an Honours programme which is made up of courses chosen from AM 260, 270, 340, 362, 364, 365, 371, 381, 391, 395, 462, 463, 464, 465, 466, 468, 472, 473, 474, 476, 481, 482, 485, 486, 488, 495.

For those students who wish a strong emphasis on Physics, the Department offers the programme “Honours Applied Mathematics with Physics Minor.”

Honours Applied Mathematics (Regular only)

Faculty core requirements as outlined in Table 1 (b) and:
(Math 331a/b or PMath 341a/b);
One of Math 332a, CS 370, 371, PMath 351a;
Math 332b or PMath 352a;
A minimum of eight Applied Math half-credits at the 300 or 400 level, at least two of which must be at the 400 level.
AM 260, 270 are recommended.

*This requirement applies only to students who have completed Math 231a/b rather than Math 234a/b as part of the requirements in Table 1 (b). The year 3 Algebra requirements for students who have taken Math 234a/b were still under review at the time this calendar was printed. Students should consult the Applied Math Undergraduate Officer.
Recommended elective courses for Honours Applied Mathematics with Physics minor are: Physics 121/122 or 162/163, 253/254, 255, 354, 362/363, 358/359, 441 and Chemistry 123/124.

Joint Honours Applied Mathematics with Computer Science
Faculty core requirements as outlined in Table 1 (b) and:
AM 371, 381, 391;
CS 240, 250, 340, 360, 370, 371;
Three of CS 350, 369, 472, 474, 476, 478, 487;
Math 332b or PMath 352a;
Math 331a;*
Five additional Applied Math half-credits at the 300 or 400 level, at least two of which must be at the 400 level.
Physics 121/122 or 162/163 in Year 1 is recommended.
AM 260 and 270 are recommended.

*This requirement applies only to students who have completed Math 231ab rather than Math 234ab as part of the requirements in Table 1 (b). The year 3 Algebra requirements for students who have taken Math 234ab were still under review at the time this calendar was printed. Students should consult the Applied Math Undergraduate Officer.

Honours Applied Mathematics with electives in Engineering (Co-operative only)
Faculty core requirements as outlined in Table 1 (b) (with CS 140, 250 required in Year 1) and:
AM 260, 270, 371, 381, 391, Math 332b;
Four of AM 340, 362, 365, CS 340, 370, 371,
C&O 350, 370, 371, Stat 333, 334, Math 331a or 334b, 332a, 380a, 380b;
A minimum of eight Applied Math half-credits at the 300 or 400 level with at least two at the 400 level.
Electives required include Physics 121/122 or 162/163 in Year 1 and two half-credits each year (one each term) beyond Year 1 from groups A, B, C, D, E, or F.

Group A ME 219, 220, CE 303, 304, ME 527 and/or ME 525;
One or more of CE 518, 522, 526, ME 626.

Group B Sy De 282, 555, Sy De 281 and/or 543;
Three or more of Sy De 352, 372, 434, 442, 468, 535, 544, 556, 567.

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**

Faculty core requirements as outlined in Table 1 (b) and:

- One of Math 332a, CS 370, 371, PMath 351a;
- Math 332b or PMath 352a;
- (Math 334a, 334b or PMath 344) or (Math 331a/b or PMath 341a/b);
- At least nine additional 300 or 400 level math half-credits. These must include at least two math half-credits from one or more of the other four departments and at least seven half-credits from the C&O department. The seven C&O half-credits must include: C&O 330, 342, 350;
- One of C&O 351, 367;
- Three of C&O 331, 343, 351, 367, 430 through 466.

Honours students in another department in the Faculty of Mathematics wishing a “double major” or a “minor” in Combinatorics & Optimization should consult the section “Combination Honours Programmes Within the Faculty of Mathematics” which begins on page 202.

**Computer Science**

Computer Science is the science 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 the machines are composed, with the organization of the units into efficient information processing systems, and with the exploration of the limits of the abilities of the machines.

Computer Science is well recognized as an independent discipline with an inherently mathematical nature. Its activity ranges from theoretical areas such as automata theory, formal languages, and computability theory, to applied areas such as numerical analysis, programming languages, software and hardware systems, and logic design. More specialized areas such as computer graphics, data base management, artificial intelligence, and automatic theorem-proving are also studied with hands-on experience playing an important role in most courses.

The advent of the computer has lead to a systems approach to solving many problems in science, business and Industry. There is currently a great demand for information analysts to define what function these systems will perform, systems analysts to determine how the systems will perform these functions, and programmers to actually implement the systems on computers. The demand for such software specialists should remain robust for many years.

The Computer Science programme at Waterloo is designed to prepare the student for the challenges of a career in this rapidly evolving technological environment. Considerable emphasis is placed on learning fundamental principles in the early part of the programme. Later, the student has the opportunity to explore the ways in which these principles are exploited in current and future areas of application.

**Honours Computer Science**

Faculty core requirements as outlined in Table 1 (b) (with CS 140 required in Year 1) and:

- CS 240, 250, 340, 350, 360, 369, 370, 371;
- Four additional CS half-credits from those labelled CS 440 or higher.

At least five half-credits chosen from the following list:

- Math 331a (or PMath 341a)*,
- Math 331b (or PMath 341b), Math 332a (or PMath 351a), Math 332b (or PMath 352a), Stat 333, 334, AM 381, 391, C&O 330, 342, 350, PMath 430a (or PMath 432a).

*Students without Math 2346 are required to take Math 331a (or PMath 341a).

**Honours Computer Science with Electrical Engineering Electives (Co-operative only)**

Computer Science requirements with the following modifications:

- exclude CS 250 and CS 369;
- include at least two of CS 450, 452, 454, 456, 457;
- include EIE 222, 241, 323, 352, 427, 454.

**Joint Honours Applied Math with Computer Science**

This programme is described with Applied Mathematics programmes.

**Joint Honours Pure Math with Computer Science**

This programme is described with Pure Mathematics programmes.
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 Programmes Within the Faculty of Mathematics" which begins on page 202.

Operations Research

How is a mathematical model of an organizational problem arising in science, industry and government formed? By what techniques is such a model analysed? These questions are answered by Operations Research, a discipline that uses the methods of optimization, statistics, and computer science.

The Honours Programme in Operations Research, which is offered by the Department of Combinatorics & Optimization, combines a solid foundation in mathematics with special sequences of elective courses in economics, business and management science. The mathematics portion of the programme includes linear programming, modelling, scheduling, game theory, forecasting, decision theory and computer simulation.

In Canada, employers of OR graduates are found in manufacturing, distribution and retail companies, mining, transportation, banking, health services, education, and government agencies. Students proceeding to a Masters of Business Administration (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

Faculty core requirements as outlined in Table 1 (b) (with CS 140, 130 required in Year 1) and:
Math 332b or PMath 352a;
Math 334b or PMath 344 (Math 331a/b or PMath 341a/b)
C&O 350, 351, 370, 371;
CS 240, 370, 437;
Stat 331, 333, 466;
Four of C&O 342, 367, 450 through 466, CS 340, 482, Stat 332, 334, 430, 442.
The thirty math half-credits required by the Faculty must include at least four at the 400 level.

Of the twelve elective half-credits required by the Faculty, students must include the following:
Two of Econ 101, 102, 281, 282, M Sci 43;
Two of Bus 352W, Econ 393, M Sci 48.

(Courses labelled BUS are offered by Wilfrid Laurier's Business School. They are described by title on page 205.)

Pure Mathematics

Pure Mathematics is the study of mathematics both for its own sake and that of possible future applications. A mastery of fundamental areas of mathematics such as algebra, analysis and geometry is essential, not only to the further development of these subjects, but also to their application either to other basic sciences or to technology. Thus, in addition to those who are especially attracted to pure mathematics, the department's programme is designed also for students who wish ultimately to apply their knowledge, but who would prefer to obtain a thorough understanding of mathematics before committing themselves to some particular area of application. Many of those Pure Mathematics graduates who do not become direct appliers of their mathematics enter the field of education, anywhere from the primary level to the most advanced research institute. Our objectives are based on the conviction that the ability to think clearly and precisely, and to continue educating oneself, are valuable in any field of endeavour.

The special interests of the Department include:
Algebra (group theory, representation theory, ring theory, lattice theory, universal algebra, linear and multilinear algebra); Analysis (generalized integrals, real and complex analysis, functional analysis); Geometry (algebraic topology, homotopy theory, differential geometry); Number Theory; Functional Equations and their applications (e.g. to information theory, probability, engineering, science and social science); Logic and Foundations.

Besides the regular Pure Mathematics Honours Programme, the Department offers two programmes for regular and stream 4 co-operative students, Joint Honours Pure Mathematics with Computer Science and Joint Honours Pure Mathematics with Statistics. These programmes give the student an opportunity to obtain skills in an applied area while keeping a strong background in Mathematics.

Honours Pure Mathematics (Regular only)

Faculty core requirements as outlined in Table 1 (b) and:
PMath 344, with Math 244b strongly recommended;
PMath 351a/b, 352a/b, 367;
Eight 400 level math half-credits, at least four of which must be Pure Mathematics.

Joint Honours Pure Mathematics with Computer Science

Faculty core requirements as outlined in Table 1 (b) (with CS 140 required in Year 1) and:
PMath 344, with Math 244b strongly recommended;
PMath 351a/b, 352a;
CS 240, 250, 340, 350, 360, 369, 370, 371;
Two half-credits from PMath 352b, 367, C&O 342, 343, Math 380a/b;
Four half-credits (at least two PMath) from 400 level PMath courses or CS courses labelled 440 or higher.
Students will normally delay taking some 300 level required courses until fourth year.

Joint Honours Pure Mathematics with Statistics
Faculty core requirements as outlined in Table 1 (b) and:
PMath 344, with Math 244b strongly recommended; PMath 351a/b, 352a.
Stat 333, 350, 351, 452, 454; Stat 334 or 450;
Three half-credits from PMath 352b, 367, 443, 451a/b, Math 380a/b, one of which must be at the 400 level,
Three additional 400 level PMath half-credits.
Students will normally delay taking some 300 level required courses until fourth year.

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 Programmes Within the Faculty of Mathematics" which begins on page 202.

Statistics
Statistics is the branch of modern applied mathematics which deals with the collection and analysis of data. Statistical methods are extensively used in Biology, Medicine, Health Sciences, Agriculture, Business, Economics, Engineering, and many other fields. Claims based on statistical arguments appear daily in the press, and it is difficult to assess these intelligently without some knowledge of statistical methods.

The statistician's first job is to determine what numbers to collect, and how to collect them so that they will be without biases and 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 programme; 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 Computer Science is highly desirable.

Honours Statistics
Faculty core requirements as outlined in Table 1 (b) and:
(Math 334a, 334b or PMath 344) or (Math 331a/b or PMath 341a/b);
Math 332b or PMath 352a;
One of Math 332a, CS 370, 371, PMath 351a;
Stat 333, 334, 350, 351, 450, 451, 452, 454;
At least two additional 400 level and two more 300 or 400 level math half-credits.

Joint Honours Pure Math with Statistics
This programme is described with Pure Mathematics Programmes.

Those interested in the degree requirements for Co-operative Honours Statistics-Economics Option should consult with the Statistics Undergraduate Officer.

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 Programmes Within the Faculty of Mathematics" which begins below.

Combination Honours Programmes within the Faculty of Mathematics
In the descriptions below 'X' and 'Y' refer to any two of Actuarial Science, Applied Mathematics, Combinatorics & Optimization, Computer Science, Pure Mathematics, Statistics.

Double Honours 'X' and 'Y' Programmes
All Honours requirements for both areas 'X' and 'Y' must be satisfied.

Honours 'X' With 'Y' Minor Programmes
All Honours requirements for area 'X' and the subset of the normal Honours requirements for area 'Y' designated below must be satisfied.

'Y' Minor Requirements
Actuarial Science:  
ACTSC 231, 232, 331, 332, MTHEL 305a;  
One of ACTSC 431, 433;  
ACTSC 337 or one 400 level ACTSC half-credit.

Applied Mathematics:  
AM 270, 365, 371, 381, 391;  
Two additional 300 or 400 level AM half-credits.

Combinatorics & Optimization:  
C&O 330, 342, 350;  
Two of C&O 331, 343, 351, 367, 430-466.

Computer Science:  
Four of CS 340, 350, 360, 369, 370, 371;  
Three additional CS half-credits in addition to  
the Faculty core.  
(Note: two of CS 140, 180, 240, 250 are included  
in the Faculty core.)

Pure Mathematics:  
PMath 344, 351a, 351b, 352a;  
Three additional 300 or 400 level PMath half-credits  
at least two of which are 400 level.

Statistics:  
One of Stat 331, 351;  
One of Stat 332, 454;  
Stat 333;  
Two additional 300 or 400 level Stat half-credits.  
(Note: Stat 351 has Stat 350 as pre-requisite.)

### Combination Honours Programmes With Other Faculties Leading to the BMult Degree

In the descriptions below 'X' refers to any one of  
Actuarial Science, Applied Mathematics,  
Combinatorics & Optimization, Computer Science,  
Pure Mathematics, Statistics.  
'Z' refers to a  
discipline in a faculty other than Mathematics.

### Joint Honours Programmes '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 from 30 to 24, provided that  
such a reduction does not make it impossible to  
satisfy all Honours requirements of 'X'. In addition to  
meeting Math average requirements of 'X', students  
in these programmes must also satisfy the Honours  
average requirements specified by 'Z'.

Students may take these programmes in either  
faculty in Years 1 and 2. In Year 3, they must  
register in the Faculty of Mathematics.

<table>
<thead>
<tr>
<th>Programmes</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actuarial Science</td>
<td>ACTSC 231, 232, 331, 332, MTHEL 305a; One of ACTSC 431, 433; ACTSC 337 or one 400 level ACTSC half-credit.</td>
</tr>
<tr>
<td>Applied Mathematics</td>
<td>AM 270, 365, 371, 381, 391; Two additional 300 or 400 level AM half-credits.</td>
</tr>
<tr>
<td>Combinatorics &amp; Optimization</td>
<td>C&amp;O 330, 342, 350; Two of C&amp;O 331, 343, 351, 367, 430-466.</td>
</tr>
<tr>
<td>Computer Science</td>
<td>Four of CS 340, 350, 360, 369, 370, 371; Three additional CS half-credits in addition to the Faculty core. (Note: two of CS 140, 180, 240, 250 are included in the Faculty core.)</td>
</tr>
<tr>
<td>Pure Mathematics</td>
<td>PMath 344, 351a, 351b, 352a; Three additional 300 or 400 level PMath half-credits at least two of which are 400 level.</td>
</tr>
<tr>
<td>Statistics</td>
<td>One of Stat 331, 351; One of Stat 332, 454; Stat 333; Two additional 300 or 400 level Stat half-credits. (Note: Stat 351 has Stat 350 as pre-requisite.)</td>
</tr>
<tr>
<td>Anthropology</td>
<td>Fourteen half-credits in anthropology, twelve of which must be at the 200-level or above; these must include one half-credit in an advanced (200-level or above) course in each of the four sub-disciplines within anthropology, (socio-cultural anthropology, archaeology, linguistics, and physical anthropology), as well as two half-credits in anthropological theory (400-level theory oriented courses). Anh 103 or Anh 104 meet the linguistics portion of these requirements.</td>
</tr>
<tr>
<td>Economics</td>
<td>101, 102, 201, 202, 231, 301, 302, 311, 321, 401, 402, 421, 422, one additional Economics half-credit.</td>
</tr>
<tr>
<td>English</td>
<td>Sixteen English Major half-credits as outlined under &quot;Joint Honours Programmes on page 96.</td>
</tr>
<tr>
<td>French</td>
<td>191 or 192; fourteen additional half-credits in French with six at the second-year level, four at the third-year level, and four at the fourth-year level.</td>
</tr>
<tr>
<td>Geography</td>
<td>A minimum of 15 half-credits (or equivalent) in Geography (up to 1.5 credits designated Environmental Studies may be counted for credit as Geography courses). Required courses are: Geography 101, 102, 110, 201, 202, 260, 275, 381; Environmental Studies 200; one of Geography 203, 204, 205, 220, 221; one of Geography 125R, 126R, 127, Environmental Studies 195b.</td>
</tr>
<tr>
<td>German</td>
<td>one of the following pairs 101/102, 105/106, 111/112, 121/122, 151/152; and four German half-credits in each of Years 2, 3, 4.</td>
</tr>
</tbody>
</table>
Philosophy 221, 222, 280, 281, 282, 283, 340, 358, 359; four additional half-credits in Philosophy.

Psychology 101, 102, 499; ten additional half-credits in Psychology chosen in consultation with the Psychology Department to fulfill their research requirements.

Russian 101, 102; four half-credits in Russian in each of Years 2, 3, and 4.

Sociology 101, 320, 321, 322, 425, 426, 481, 499; seven additional half-credits in Sociology.

Honours 'X' with 'Z' Minor
All Honours requirements for area 'X' ('X' as defined above) and a set of 10 half-credits prescribed by discipline 'Z' where 'Z' can be any departmental area (not necessarily restricted to the 'Z' 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 10 half-credits is determined by 'Z'.

Note
BMath transcripts are to include no more than two areas of study. Note that in the case of some programmes (e.g. Math/Business Administration, Chartered Accountancy, Management Accounting and Teaching), "Mathematics" is an implied "area of study".

Combination Honours Programmes leading to a degree in another faculty (i.e. not BMath) are described on page 208.

Non-Departmental Honours and General Programmes: Requirements and Recommendations
Except where noted, Honours and General programmes may be taken on either the regular or co-operative system of study.

Faculty General and Pass Programmes: Requirements and Recommendations
As indicated earlier, the General and Pass Programmes are intended for students with an interest in the mathematical sciences who do not want the intense specialization required in Honours Programmes. Although there are no formal departmental programmes in Pass or General, students in these programmes may associate themselves with a department at the beginning of Year 3. This procedure allows Pass or General students to turn to departmental undergraduate officers for advice but does not subject them to departmental degree requirements.

General Mathematics
Faculty core requirements as outlined in Table 1(b) and:
Math 324a/b (or 321a/b);
One of Math 322a, CS 370, 371;
Math 322b

Pass Mathematics (Regular only)
Faculty core requirements as outlined in Table 1(b)

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 School of Business and Economics at Wilfrid Laurier University, the Department of Economics and the Department of Management Science at Waterloo, offers three unique programmes 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 in both the regular and co-operative systems 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 programme qualifies a student for twelve RIA exemptions and also to write three of the Society's six Uniform National Examinations.

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 able to complete all Institute or Society requirements in as little as one year after graduation. Graduates of the regular programme are able to complete all such requirements in as little as two years after graduation.

Note that, in the requirements and recommendations which follow, courses labelled BUS are offered by Wilfrid Laurier's Business School. These courses are:

- Bus 111 W - Introduction to Business Organization
- Bus 121 W - Functional Areas of the Organization
- Bus 231 W - Business Law
- Bus 352 W - Introduction to Marketing
- Bus 357 W - Taxation
- Bus 362 W - Marketing Functions
- Bus 388 W - Organizational Behaviour
- Bus 398 W - Administrative Practices
- Bus 454 W - Personnel Management
- Bus 477 W - Auditing
- Bus 481 W - Business Policy
- Bus 491 W - Management Policy

The WLU academic calendar should be consulted for complete course descriptions and pre-requisites.

Honours Mathematics/ Business Administration Option
Faculty core requirements as outlined in Table 1(b) (with CS 140, 180 required in Year 1), one of the packages listed below and:

Elective half-credits required include:
- ACTSC 231, C & O 270, CS 434, are recommended.

Note:
- Econ 101, 102, 281, 282, Bus 111 W, 121 W are normally taken in Year 1.
- Bus 231 W, 352 W, 362 W are normally taken in Year 2.
- Econ 393, 394, MSci 44, 53 are normally taken in Year 3.
- Bus 454 W, 481 W, 491 W, MSci 48 are normally taken in Year 4.

a) Information Systems Package
- CS 240, 330, Stat 331;
- Four additional 300 or 400 level CS half-credits including CS 338 or (CS 340 and CS 448); CS 432 or CS 434 or (CS 340 and CS 482);
- Two of C&O 350, 370, 454, Math 380a;
- One of Stat 332, 333, 442, 468;
- Two additional math half-credits.

Note: (Credit may be granted for only one of CS 338, 448 and only one of CS 432, 434, 482.)

b) Optimization Package
- C&O 350, 351, 370, 454, CS 330, 338, Stat 331;
- Two of C&O 367, 456, 459;
- One of Stat 332, 333, 442, 468;
- Two additional math half-credits.

c) Statistics Package
- Stat 330 or 350, 331 or 351, 332, 442, 466, CS 330, 338;
- Two of C&O 350, 370, 371, 454;
- One additional 300 or 400 level Stat half-credit chosen in consultation with the Statistics Undergraduate Officer;
- Two additional math half-credits.

Notes:
1. This programme requires a total of 48 half-credits, 24 of which must be math half-credits. This is normally accomplished by including 3 math half-credits each term in Years 2, 3, 4 rather than 4 as implied by Table 1(b).

2. A minimum average of 70% is required, based upon 24 math half-credits (including those required). As well, a minimum average of 70% is required based upon 41 half-credits, consisting of the 24 math half-credits mentioned previously and the 17 explicitly required non-math elective half-credits.

General Mathematics/ Business Administration Option
Faculty core requirements as outlined in Table 1(b) (with CS 140, 180 required in Year 1) and:

- Two of CS 250, 330, 338;
- Two of ACTSC 221, Stat 330, 331, 332, 333;
- Two of C&O 270, 350, 351, 370, 371, 454, 459, 464;
Elective half-credits required include:

Note:
Econ 101, 102, 281, 282, Bus 111W, 121W are normally taken in Year 1.
Bus 352W, 362W are normally taken in Year 2.
Bus 388W, 398W are normally taken in Year 3.
Bus 481W, 491W are normally taken in Year 4.

Honours Mathematics/Chartered Accountancy Option
Faculty core requirements as outlined in Table 1(b) (with CS 140, 180 required in Year 1), one of the packages listed below and:
Elective half-credits required include:
Econ 101, 102, 191, 192, 291, 292, 391, 392, 393, 394, 491, Bus 111W, 121W, 231W, 357W, 477W.
C&O 270, CS 434, ACTSC 231, Econ 492 are recommended.
*Bus 357W may be replaced by Econ 493/494.

Note:
Econ 101, 102, 191, 192, Bus 111W, 121W are normally taken in Year 1.
Econ 291, 292, Bus 231W are normally taken in Year 2.
Econ 391, 392, Bus 477W are normally taken in Year 3.
Econ 393, 394, 491, Bus 357W are normally taken in Year 4.

a) Information Systems Package
CS 240, 330, Stat 331;
*Four additional 300 or 400 level CS half-credits including CS 336 or (CS 340 and CS 448); CS 432 or CS 434 or (CS 340 and CS 482);
Two of C&O 350, 370, 454, Math 380a;
One of Stat 332, 333, 442, 466;
Two additional math half-credits.
CS 250 is recommended.
(*Credit may be granted for only one of CS 336, 448 and only one of CS 432, 434, 482.)

b) Optimization Package
C&O 350, 351, 370, 454, CS 330, 338, Stat 331;
Two of C&O 367, 456, 458;
One of Stat 332, 333, 442, 466;
Two additional math half-credits.

(c) Statistics Package
Stat 330, or 350, 331 or 351, 332, 442, 466, CS 330, 338;
Two of C&O 350, 370, 371, 454;
One additional 300 or 400 level Stat half-credit chosen in consultation with the Statistics Undergraduate Officer;
Two additional math half-credits.

Mathematics
Faculty General and Pass Programmes
Requirements and Recommendations

Notes:
1. This programme requires a total of 48 half-credits, 24 of which must be math half-credits. This is normally accomplished by including 3 math half-credits each term in Years 2, 3, 4 rather than 4 as implied by Table 1(b).
2. A minimum average of 70% is required, based upon 24 math half-credits (including those required). As well, a minimum average of 70% is required based upon 41 half-credits, consisting of the 24 math half-credits mentioned previously and the 17 explicitly required non-math elective half-credits.

General Mathematics/Chartered Accountancy Option (Regular only)
Faculty core requirements as outlined in Table 1(b) (with CS 140, 180 required in Year 1) and:
Two of CS 250, 330, 338;
Two of ACTSC 221, Stat 330, 331, 332, 333;
Two of C&O 270, 350, 351, 370, 371, 454, 459, 464;
Elective half-credits required include:
Econ 101, 102, 191, 192, 291, 292, 391, 392, 393, 394, 491, Bus 111W, 121W, 231W, 357W, 477W.
*Bus 357W may be replaced by Econ 493/494.

Note:
Econ 101, 102, 191, 192, Bus 111W are normally taken in Year 1.
Econ 291, 292, Bus 231W are normally taken in Year 2.
Econ 391, 392, Bus 477W are normally taken in Year 3.
Econ 393, 394, 491, Bus 357W are normally taken in Year 4.

Honours Mathematics/Management Accounting Option
Faculty core requirements as outlined in Table 1(b) (with CS 140, 180 required in Year 1), one of the packages listed below and:
Elective half-credits required include:
Econ 101, 102, 191, 192, 291, 292, 391, 392, 393, 394, 491, Bus 111W, 121W, 231W, 357W, 477W.
*Bus 357W may be replaced by Econ 493/494.

Note:
Econ 101, 102, 191, 192, Bus 111W are normally taken in Year 1.
Econ 291, 292, Bus 231W are normally taken in Year 2.
Econ 391, 392, Bus 477W are normally taken in Year 3.
Econ 393, 394, 491, Bus 357W are normally taken in Year 4.
a) **Information Systems Package**
CS 240, 330, Stat 331;
* Four additional 300 or 400 level CS half-credits including CS 338 or (CS 340 and CS 448); CS 432 or CS 434 or (CS 340 and CS 482);
Two of C&O 350, 370, 454, Math 380a;
One of Stat 332, 333, 442, 466;
Two additional math half-credits.
CS 250 is recommended.
(* Credit may be granted for only one of CS 338, 484 and only one of CS 432, 434, 482.)

b) **Optimization Package**
Two of C&O 367, 456, 459;
One of Stat 332, 333, 442, 466;
Two additional math half-credits.

c) **Statistics Package**
Stat 330 or 350, 331 or 351, 332, 442, 466, CS 330, 338;
Two of C&O 350, 370, 371, 454;
One additional 300 or 400 level Stat half-credit chosen in consultation with the Statistics Undergraduate Officer;
Two additional math half-credits.

**Notes:**
1. This programme requires a total of 48 half-credits, 24 of which must be math half-credits. This is normally accomplished by including 3 math half-credits each term in Years 2, 3, 4 rather than 4 as implied by Table 1(b).

2. A minimum average of 70% is required, based upon 24 math half-credits (including those required). As well, a minimum average of 70% is required based upon 40 half-credits, consisting of the 24 math half-credits mentioned previously and the 16 explicitly required non-math elective half-credits.

**General Mathematics/Management Accounting Option**
Faculty core requirements as outlined in Table 1(b)
(with CS 140, 180 required in Year 1) and:
Two of CS 250, 350, 338;
Two of ACTSC 221, Stat 330, 331, 332, 333;
Two of C&O 270, 350, 351, 370, 371, 454, 459, 464;
Elective half-credits required include:
* Bus 357W may be replaced by Econ 493/494.

Note that Stat 331 is required by the Society of Management Accountants, but not for the BMath degree.
General Mathematics Teaching Option
Faculty core requirements as outlined in Table 1(b) and:
Math 324a/b (or 321a/b);
Math 322b;
One of Math 322a, CS 370, 371;
At least five of ACTSC 221, C&O 220, 270, 380, 381, 480, 481;
A total of at least four Computer Science half-credits.
Elective half-credits required include MTHEL 206a, Psych 212 and Psych 312 in Year 2, and Soc 207G, Phil 311 and Phil 312 in Year 3.

Note
The Faculty of Education at the University of Western Ontario requires that Psych 212, 312 and Phil 311, 312 be part of the B Ed degree. As a result, four half-credits are required in addition to the requirements for the BMath degree; that is, Honours students must complete a minimum of 52 half-credits and General students must complete a minimum of 46. To achieve this, Honours students normally take seven half-credits each term in Years 2 and 3; General students normally take six.

Combination Honours Programmes leading to a degree with another faculty.
Joint Honours Programmes
Joint Honours programmes exist between the Faculty of Mathematics and any one of the following: Economics, French, Geography, German, Man Environment Studies, Philosophy, Psychology, Russian, Sociology.

Students may take these programmes in either faculty during Years 1 and 2. At the beginning of Year 3 they must register in the appropriate department in Arts or Environmental Studies, and have their programmes approved by that department.

The Mathematics requirements are:*Maths 120a/b, 124a/b, 220ab, (221ab or 224ab);
At least six additional Math half-credits which would be acceptable toward a BMath degree.
A minimum average of at least 70% on these fourteen Math half-credits is required.

* Some substitutions are permitted. See the note following Table 1(b) on page 197.

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 mathematics courses.

Minor in Mathematics
A 'Minor in Mathematics' has been introduced for Honours students in another faculty, consisting of 10 half-credits in mathematics, namely: Math 120a/b, 124a/b, 2 of CS 140, 180, 240, 250; 4 additional math half-credits which would be valid for BMath degree credit. A minimum average of 70% is required on the 10 math half-credits.

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, economics, engineering, forecasting, optimization, physics, pattern recognition, picture processing, and system designs. The Centre organizes a Seminar and Lecture Series on Information Theory and publish 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.
Faculty Policies

1 STANDINGS & PROMOTIONS COMMITTEE

Membership, Duties, Operating Procedure
The Standings & Promotions Committee consists of the Dean, Associate Deans, Department Chairmen, Director of Undergraduate Affairs, Programme Undergraduate Officers, the Senior Mathematics Co-ordinator, the Assistant Registrar, Mathematics (who is the Committee's non-voting secretary), and a representative of the Math Society.

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 & Promotions Committee may be authorized only by that Committee. Requests or appeals of this nature must be made in writing to the Committee's Secretary (the Assistant Registrar, Mathematics, in Needles Hall). When the Committee feels that the circumstances outlined in writing justify their giving an individual student special treatment that others would not receive, such requests are usually granted. (It is often in a student's best interest to discuss this type of situation with a faculty advisor before formally approaching the Standings & Promotions Committee. Committee meetings are scheduled by the Assistant Registrar, Mathematics, normally every other week.)

2 PROMOTIONAL POLICIES

2.1 Required Withdrawal from Co-op
A student will normally be allowed to remain in a cooperative math programme if he/she has satisfied all of the following requirements:

(i) an overall cumulative average ≥ 60.
(ii) no more than 2 half-credit failures in any one term.
(iii) no more than 3 half-credit failures in any two consecutive full-time academic terms.
(iv) no more than 8 half-credit failures in total.

Continuation in a Co-operative programme is also contingent upon satisfactory performance on work terms and work reports.

2.2 Required Withdrawal from Honours
When an Honours student has exceeded 8 half-credit failures, he/she will be required to withdraw from the Honours programme. In those cases where the student has not fallen into one of the categories warranting required withdrawal from the Faculty (see below), he/she will still be eligible to pursue a Pass or General degree. In such instances, however, the student will not normally be permitted to take an Honours level course when there is a corresponding General level course available.

2.3 Required Withdrawal from Mathematics
A student will normally be required to withdraw from the Math Faculty if he/she is in one or more of the following categories:

(i) exceeded 10 half-credit failures (or equivalent).
(ii) failed to satisfy all requirements for the BMath Pass degree by the end of the first term in which the student has accumulated 44, or more half-course attempts.
(iii) is unlikely to profit from further study in the Math Faculty (in the opinion of the Standings & Promotions Committee).

A student who has been required to withdraw from the Math Faculty will not normally be readmitted to a degree programme in Mathematics at any point in the future.

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. 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 (INC, NMR, DNW count as zeroes in overall cumulative average calculations.)
The average displayed on end-of-term 'Student Examination Reports' (i.e. mark reports that are reviewed each term by the Standings and Promotions Committee and released to individual students by the Registrar's Office) are intended only to give an indication of student progress. They do not correspond exactly to the average requirements for a BMath degree. (For example, the "graduating math average" cannot be calculated until all required Math courses have been successfully completed.) The overall average includes all marks displayed on the mark report (counting zero from DNW, NMR, INC). Two math averages are displayed. One includes the marks of all 'math' courses taken, whether passed or failed. The other includes only the marks of successfully completed 'math' courses. Only the best mark is used if 'math' courses have been repeated. ('Math' refers to courses with the following subject abbreviations: ACTSC, AM, CS, C&O, MATH, PMATH, STAT.)

All Faculty and Departmental courses required for a particular degree will be included in the "Graduating" Math Average. For Honours programmes requiring more than 30 Math half-credits (e.g. Double Honours), all such credits will be included in the "Graduating" Math Average. For Honours programmes which require fewer than 30 Math half-credits, only those required credits will be included. In addition to meeting Math Average requirements, students in Combination Honours programmes with other faculties must also satisfy Honours average requirements specified by the other department.

3.2 Grade Appeals
Any student wishing to appeal a grade may do so by contacting the Secretary of the Standings & Promotions Committee (the Assistant Registrar, Faculty of Mathematics, in Needles Hall). Such an appeal must (i) be made in writing within one month of the official release of that term's grades, (ii) specify the course(s), instructor(s) and grade(s) involved together with reasons why the appeal is being made, (iii) include $5.00 per grade appealed (which is refunded if the grade is raised). Please note, however, that a grade may be lowered if a re-examination leads to the discovery of an earlier error in the student's favour.

4 POLICIES RE: COURSES

4.1 Corresponding Advanced/Honours/General Courses
Certain core subjects are offered at three different levels. The advanced level courses are intended for exceptionally gifted students in an Honours programme. A student pursuing an Honours degree may substitute the corresponding Advanced level course(s) for any required Honours level course(s).

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 & Promotions Committee to switch from an Honours programme to General or Pass. In this case, the student must enrol in General courses.

4.2 Course Upgrading
A student who takes the General version of a course instead of the Honour's version (e.g. Math 220a instead of 230a), but later decides to pursue an Honours degree, may petition the Standings & 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 course and obtained that final mark. Otherwise, the student must formally take the Honours course. (Special provisions apply to Math 120a/b; 124a/b; A grade of at least 80% in one of these courses will count as satisfying the corresponding Honours level course requirement.)

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 Math Average required for the degree in question. Note that supplemental examinations are not available for students in the Math Faculty.

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 Math Average pertaining to degree requirements.
4.5 No Credit/Overlap Courses

Some courses offered within the university may not normally be taken for credit toward a BMath degree. The mathematical content which these courses often contain 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.

A list of such courses is maintained in the Mathematics Undergraduate Office and is published from time to time.

4.6 Correspondence Courses

The Correspondence Programme at the University of Waterloo offers a large variety of courses each term for part-time students. The Mathematics Faculty feels that the Correspondence Programme should normally be restricted to 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 will not normally be permitted.

Correspondence courses offered in the fall term do not generally begin until late October and normally (i.e. assuming no postal service problems, for example) have their final exams at the beginning of the following February. In this regard the Mathematics Faculty has adopted a policy whereby a student with less than a 70% overall average in his/her most recent complete academic term may not normally take a correspondence course on a part-time basis during the fall term if he/she will be registered full-time during the winter term. This policy is intended to limit this type of situation to students who should be able to cope with the overlap involved with studying for and writing final examinations in fall-term correspondence courses while simultaneously carrying a full-time load of on-campus winter courses.

Correspondence courses may not normally be used to satisfy explicitly stated course requirements for an Honours programme. It is the intent of this policy to require that all such degree requirements be satisfied entirely by on-campus courses. Any additional electives, whether mathematics or non-mathematics courses, may be taken on a part-time basis by correspondence for Honours degree credit. It should also be noted that this policy applies only to Honours programmes. No such restriction applies for General or Pass programmes.

Subject to the limitations described in earlier paragraphs, correspondence courses may be taken on a part-time basis by regular and co-op students during terms off campus. (Note that while on work term, Co-op students are normally limited to one half-credit course.) Interested students are encouraged to discuss correspondence course selections with their “on campus” faculty advisor, but the actual paperwork to pre-register for Correspondence courses involves completely separate application forms available only in the Correspondence Programme Office (Physics Building, Room 375).

4.7 Courses at Other Universities (Letters of Permission)

Students in good academic standing (i.e. at least 60% cumulative overall average) are normally permitted to take elective courses at other universities on a part-time basis during terms off campus to count as credits toward a Bachelor of Mathematics degree at Waterloo. However, only under very special circumstances will full-time math students be permitted to take mathematics courses (i.e. Math, CS, Stat, etc) at other institutions to count toward their Waterloo degree requirements. Students wishing to take courses at other universities may apply to the Standings & Promotions Committee for permission by completing a special “Letter of Permission” form available from the Mathematics Undergraduate Office or the Registrar’s Office.

Please note that permission must be obtained before taking the course. The Committee will not normally approve a course taken elsewhere for Waterloo degree credit if prior approval was not obtained.

All courses taken on “letters of permission” at other institutions will be treated as if they had been taken at Waterloo (for Standings & Promotions purposes). Note that, while on a work-term, Co-op students normally are limited to one half-credit course.

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 is sent to the Registrar’s Office within two months of the completion of the course. Otherwise, a grade of DNW (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 by the Standings & Promotions Committee.
4.8 Dropping/Adding Courses

There are two deadline dates each term, one for adding courses (this includes changing sections) and a second for dropping courses. The last day to ADD a course is 2 weeks after the official beginning of lectures. The last day to DROP a course is 6 weeks after the official beginning of lectures in the term the course terminates. (These deadline dates apply only to Math Faculty students.)

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. Further, if a two-term course registration is cancelled after the drop deadline in the first term of the course but before the drop deadline in the second term of the course, the course will be recorded as a half-credit course attempt.

A course attempt not successfully completed constitutes a course failure. Further, a two-term course registration cancelled between drop deadlines (see above) constitutes an unsuccessfully completed half-credit course attempt, hence a half-credit failure.

5 MISCELLANEOUS POLICIES

5.1 Special Co-op Regulations

(i) Co-operative mathematics students are expected to follow the academic/work term sequence appropriate to their programme from admission through to graduation.

Requests to alter this sequence must be directed to the Assistant Registrar, Mathematics, on special forms available from the Registrar's Office, Department of Co-ordination or Mathematics Undergraduate Office. Such a request will normally be approved if all of the following criteria are met: (1) 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. (2) The student's employer supports the request in writing. (3) There is no obvious indication that the stream requested will result in serious course selection difficulties for the student. (4) The request does not reduce the number of work terms remaining for the student at the time of his/her request. (5) The request does not result in the student having more than two consecutive work terms. (6) The requested change does not result in a work term following the completion of the academic requirements for the programme. [Any request which has such a work term scheduled is considered to be one which will violate criterion (4).] (7) The request is properly documented.

(ii) Unless supported in writing by his/her employer, the Standings & Promotions Committee is not prepared to consider a co-op student's request to take more than one half-credit course while on a work term.

(iii) While registered for an academic term on campus, Co-op Math students are normally expected to maintain a full-time course load. In the case of the 'graduating' term, enrolment need only be maintained in those courses needed to satisfy degree requirements.

5.2 Course Load, Part/Full-Time, Complete Term

No student may pre-register for more than 6 courses per term. Students in Year 3 and 4 may add additional courses, to a maximum of 8, during the two-week course-change period at the beginning of term if their academic record justifies a heavier course load. Students in years 1 and 2 must have an academic record of sufficiently high calibre to take more than 6 courses. For new students in year 1, addition of extra courses in the first term will normally be restricted to students with both admission averages at least 80%.

For current students in Years 1 and 2, addition of extra courses will normally be restricted to students with both overall and math averages at least 75% during the student's most recent complete term. In cases where the student was registered in more than 6 courses in the previous term and had both averages at least 70% in those courses, he/she will be permitted to register in the same number of courses in the subsequent term. The burden of proof is left to the student when seeking approval to take extra courses (i.e. the student should have his/her most recent mark report when seeking approval and not expect the Faculty Advisor to supply the necessary verification). In all cases a student's "year" will be determined by the number of half-credits (N) achieved to date according to the scheme below.

<table>
<thead>
<tr>
<th>Year</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>first year</td>
<td>0 ≤ N ≤ 10</td>
</tr>
<tr>
<td>second year</td>
<td>10 ≤ N ≤ 20</td>
</tr>
<tr>
<td>third year</td>
<td>20 ≤ N ≤ 32</td>
</tr>
<tr>
<td>fourth year</td>
<td>32 ≤ N</td>
</tr>
</tbody>
</table>

A student registering for one or two courses per term is considered to be part-time and fees are assessed exclusively on a per-course basis. A student registering for more than two courses is considered to be full-time and fees include extra provisions for an incidental fee (student federation membership, athletics, etc.) and a co-op fee (for students in co-operative programmes).
5.3 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 zero in overall cumulative 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 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.

5.4 Voluntary Withdrawal

A student may withdraw from the Faculty of Mathematics within the first six weeks of classes in a term without incurring any academic penalty. (A special 'Withdrawal Form', available in the Mathematics Undergraduate Office or the Registrar's Office, must be completed.) A student who withdraws after this date 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.

5.5 'Inactive' Status/Re-Admission

A BMath degree candidate who has been 'inactive' for more than 4 consecutive academic terms must apply for re-admission by writing to the Secretary of the Mathematics Admissions Committee (the Assistant Registrar, Mathematics, in Needles Hall). A résumé covering the 'inactive' period, including official transcripts from any post secondary institutions attended, must accompany the letter requesting re-admission. No special application form is required. When re-admitted, such a student would 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 DEAN'S HONOURS LIST/ALUMNI GOLD MEDALLIST

To recognize outstanding academic performance each term, the designation "Dean's Honours List" will be awarded to undergraduate Mathematics students in an Honours programme whose term averages (both math and overall) \( \geq 85\% \), based on at least 6 half-credits. This designation will be reflected on end-of-term grade reports and official university transcripts. Note that in the first 'N' such terms, a student must enrol in the appropriate Advanced level Algebra and Calculus courses, i.e. Maths 140a/b, 144a/b, 240a/b, 244a/b. (Normally N = 4; however, a student with advanced standing who begins with Math 240a, 244a, for example, would be an exception.)

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) \( \geq 85\% \), 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 Faculty Colloquium Room (MC.5158).

An Alumni Gold Medal is presented annually (usually at the Spring Convocation) to recognize the academic excellence of our top undergraduate. Last year, Darlene Plebon won this award on the basis of outstanding academic achievement throughout her undergraduate career.

7 ENGLISH WRITING SKILLS
BMath degree candidates with an initial registration of Fall/80 or later must satisfy a WRITING SKILLS REQUIREMENT, namely:

“A grade of 65% or better on the ELPE, OR a half-credit with a mark of C- or better in a term-course chosen from a list, approved by the Curriculum Committee, to be maintained in the Math Undergraduate Office, OR Four satisfactory Work Reports.”
NOTE: ELPE = UW English Language Proficiency Exam.

8 “AREAS OF STUDY” ON TRANSCRIPTS
BMath transcripts are to include no more than two areas of study. Note that in the case of some programmes, (e.g. Math/Business Administration, Chartered Accountancy, Management Accounting or Teaching) “Mathematics” is an implied “area of study”.
Faculty of Science

Biology
Faculty of Science

Introduction
The first students were enrolled in the Faculty of Science in the autumn of 1959. There are now approximately 2,000 full-time students including 200 graduate students, taking programmes within the Faculty.

The Faculty of Science has five teaching departments: Biology, Chemistry, Earth Sciences, Physics, and the School of Optometry. Programmes of studies through the Biology, Chemistry, Earth Sciences, and Physics departments lead to a Bachelor of Science (BSc) degree in either 3 or 4 years depending upon the programme taken. The School of Optometry offers a four year professional programme leading to a Doctor of Optometry (OD) degree.

Biology, Chemistry, Earth Sciences and Physics are also available on a Co-operative System of Study where 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.

For those students whose leanings are more towards administration than research or teaching there is a General Science and Business programme. A programme leading to an Honours BSc in Psychology is also available.

The Associate Dean and Department Chairmen will be pleased to receive inquiries about the programmes in this Faculty.

Degrees
The degree of Bachelor of Science (BSc) is awarded by the University on the successful completion of any of the undergraduate programmes involving Biology, Chemistry, Earth Sciences, Physics and Psychology which are discussed under Academic Programmes. The ordinary or pass-level BSc will be awarded on completion of the General Science Programme in either the three or four-year option. The honours degree, BSc (Honours), will be awarded on completion of any of the honours programmes. MSc and PhD degrees are discussed in the Graduate Calendar.

Upgrading of BSc Degree
A student who has graduated with a 3-year General degree from this University only, may successfully complete the requirements of the 4-year degree with an official major field designation and exchange the old diploma for a new one. 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 requirements and procedures for all programmes are outlined in Chapter 2 of this Calendar. The following points emphasize some of the admission requirements which relate specifically to programmes in the Faculty of Science.

Applicants from Ontario Grade 13
Satisfactory completion of six Grade 13 credits with a 60% overall average as well as 60% overall average in Math (Calculus and one of Relations and Functions or Algebra) and two Sciences (one of which must be Physics or Chemistry). Applicants with overall Grade 13 averages of 65% or above will be given first consideration. Those with less than this average may be invited to come to the University for an interview to discuss their qualifications and career objectives. Co-op Physics requires 70% average in Math and Physics. Co-op Chemistry requires 70% in Chemistry and in Maths.

Co-operative students
Students applying to co-operative programmes in the Faculty of Science will not normally be admitted above the Year 2 Term B level.

Transfer students
Students will be accepted for transfer from other programmes in the University or from other universities. Their programmes will be evaluated in terms of the number of credits allowed and the number remaining for a degree. Normally students will be required to complete 50% of the course content 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.

Admission as an Adult Student
It is recommended that applicants obtain standing in at least one Ontario Grade 13 Mathematics and one Science course or their equivalent in order to have the proper background for first year University courses in these areas. To discuss admissibility and appropriate qualifying works, applicants are advised to contact the Assistant Registrar, Faculty of Science.
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 programmes. Further details concerning University Examination Regulations can be found in Chapter 1.

Students should note that the Faculty of Science operates under a "course system" in which student progress is measured by courses successfully completed rather than by years. Students who have passed fewer than five courses successfully will be considered Year 1 students; those with at least five but fewer than ten, Year 2; those with at least ten but fewer than fifteen, Year 3; and those with fifteen or more; Year 4.

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 term or year marks.
b) Final examinations in one-term courses are held in December, April, or August. Final examinations for all full year courses are held in April, and cover all the work taken in each course. 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 in a course, a student must have satisfied all term work requirements in the course and must have the permission of the Examinations and Standings Committee (who must be satisfied the student has a fair chance to pass the examination - the student's overall University record may be used in making this assessment.) Regardless of standing, no student will be allowed make-up privileges if he or she has failed more than two full courses or their equivalent in a given year (except on medical grounds as in a).

In all cases regarding make-up examinations the student must have satisfied all term work requirements in the course and must have the permission of the Examinations and Standings Committee (who must be satisfied the student has a fair chance to pass the examination - the student's overall University record may be used in making this assessment.) Regardless of standing, no student will be allowed make-up privileges if he or she has failed more than two full courses or their equivalent in a given year (except on medical grounds as in a).

Examinations and Standings

b) Only when such failed courses could not be repeated and when a student's progress could be unduly held up by lack of one prerequisite.

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) In cases where more than one course or course-sequence contains the same or similar course content, credit will only be given in one.
h) All examinations which receive a failing grade are automatically re-read.

2) Make-up Examinations
Make-up examination privileges may be granted to students in good standing:
a) In a case where failure to pass is attributable to extraordinary circumstances, especially medical or health-related problems.
b) Only when such failed courses could not be repeated and when a student's progress could be unduly held up by lack of one prerequisite.

In all cases regarding make-up examinations the student must have satisfied all term work requirements in the course and must have the permission of the Examinations and Standings Committee (who must be satisfied the student has a fair chance to pass the examination - the student's overall University record may be used in making this assessment.) Regardless of standing, no student will be allowed make-up privileges if he or she has failed more than two full courses or their equivalent in a given year (except on medical grounds as in a).

Except in extraordinary circumstances (e.g. a) above), when a make-up examination is passed, the course will count as a course passed toward the degree, but the mark obtained will not be counted in determining cumulative average (i.e. the original mark will normally be the mark which counts).

3) Co-operative Programme Evaluation
Students in co-operative programmes will be evaluated by the rules shown modified where necessary to suit their special needs. In particular:

a) Evaluation in Year 1 will be made at the end of term 1B on the entire year's work. In order to proceed to term 2A students must have obtained
a 60% overall average, 60% or better in their major field and passed all core courses. Those not meeting these requirements may be transferred to the General programme (non-co-op) in good standing, if possible.

b) Upper year assessment will be made on a term by term basis. Beyond Year 1, the various programmes are mostly composed of one-term courses in which all marks are final. Depending on electives chosen there may be some mixture of term and full-year courses. Assessment made in terms of 2A and 3A will be on the basis of marks in all courses taken; for assessments in terms 2B and 3B, marks given for the second half of a full-year course will be the final mark for the course and will replace the A term mark for average purposes. 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. Students from any co-operative programme may be transferred to the General programme (non-co-op) if they are deemed to be making unsatisfactory progress towards their Honours degree. Normally a student may take no more than two upper year terms on a part-time or reduced programme 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 programmes.

   The minimum number of related work terms required is normally four.
   The minimum number of satisfactory work reports is normally four.

4) Standing

Grades
Marks in individual courses will be reported as numerical marks on the scale 0 to 100. A mark of 50 or better is necessary to pass and receive credit for a course. For Science students, the lowest mark to be recorded and averaged will be 32, equivalent to the weighting factor for the F- on the common grading 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.

Required to Withdraw
Students who have been “required to withdraw” from the Faculty of Science may not apply for readmission for at least two academic terms.

   After one year has 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), AEG (aegrotat - signifying the student’s work or examination was incomplete for some acceptable reason (such as illness) and his instructor felt the student should receive credit for the course but a numerical mark could not be set). 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. Then, if the required courses and accumulated average are met, the student will be allowed to graduate.

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 the lowest possible failing mark (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 each 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.

Credit
Credits are assigned for lecture and laboratory courses as designated in the course descriptions (also see chapter 15).

Dean's Honours List
Beginning in 1979, the Faculty of Science introduced a Dean's Honours List for full-time Honours students who have completed second year studies or higher during the previous twelve months.

The list of nominations will not exceed 10% of the number of such students in each Department. To be eligible for consideration a student must have a cumulative average and an overall average for the completed year of at least 80%.

The award will be noted on the student transcript, and the student will receive a congratulatory letter from the Dean.

Academic Programmes (see also p. 220)

General Programmes - 3 year General and 4 year General (Major) Requirements (see p. 243)
The 4 year General Programme begins at the Year 2 level, admission to which requires a 55% overall average as well as 60% or better in the field of specialization. A 60% cumulative average in the major field courses must be maintained in the 4 year General programme.

To continue in the general programmes a full-time student carrying the normal 5 lecture course load must maintain a cumulative average of 55% with a minimum of 3.0 lecture credits obtained per academic year and no more than 2.0 failed. Failure to meet these requirements could result in a Conditional Standing or a requirement to withdraw. A Conditional Standing may be allowed the first time depending upon the circumstances.

Of the total 15 credits required in the 3 year General programme at least 14 must be lecture credits. No more than 21 attempts will be allowed.

Of the total credits required in the 4 year General programme (20 or greater) at least 18 must be lecture credits the number dependent on the programme. No more than 6 attempts over and above the number of credits required will be allowed.

Not more than 3 credits offered under the "Science" label may be applied to any general degree.

All 4 year General students must take Year 4 of the programme through the University of Waterloo.

Honours Programmes

Introduction
Admission to the Co-operative Biology, Chemistry, Earth Sciences, and Physics programmes is at Year 1 (see Chapter 2 for Admission Requirements). All other programmes begin at the Year 2 level, admission to which requires a 60% overall average as well as 60% or better in the field of specialization.

To be eligible for an Honours degree a student must have been enrolled in two out of three of Years 2, 3 and 4 of an Honours Programme, one of which must be Year 4. Year 4 of the programme must be taken at the University of Waterloo.

a) Honours Science Programmes (see p. 241)
4 programmes, with specialization in Biology, Chemistry, Earth Sciences, or Physics; and a non-specialized programme.

A 60% cumulative overall average must be maintained in all programmes.

A 60% cumulative average must be maintained in all courses in the field of specialization.

A 60% cumulative average must be maintained in all Faculty of Science courses in the non-specialized programme.

A student who fails one of the credits in the field of specialization may be placed on probation in order to clear that requirement. Failure of more than one such course could result in requirement to withdraw from that programme.

Not more than 3 credits offered under the "Science" label may be applied to any Honours Programme.

b) Honours Major Programmes (see also p. 221)
Honours Biology - regular and co-operative Honours Biology and Chemistry - regular * Honours Biology and Man-Environment - regular Honours Chemistry - regular and co-operative applied Honours Earth Sciences - regular (Geology or Geography) and co-operative applied (Geology, Geophysics or Geotechnical) Optometry - regular Honours Physics - regular and co-operative applied Honours Psychology - regular

* Preparations are being made to offer this programme on a co-operative basis as well in 1981-82. Ask for further information at the Science Undergraduate Office.

In all programmes an overall cumulative average of 60% must be maintained with a cumulative average of at least 60% in the major field.

In the Optometry programme an overall 60% average as well as a 60% average in the courses of
the major subject must be obtained each academic year. In the Optometry programme a student who fails to demonstrate clinical competence as evidenced by a failing grade in a clinical course may not continue in the programme.

In the Honours Earth Sciences (Geography) programme a cumulative average of 75% must be maintained in the Geography courses, and a cumulative average of 60% in the other courses.

In the Honours Psychology programme a cumulative average of 75% must be maintained in the Psychology courses and a cumulative average of 60% in the Faculty of Science courses.

A student who fails one of the credits in the field of specialization may be placed on probation in order to clear that requirement. Failure of more than one such course could result in requirement to withdraw from that programme.

In the Honours Biology programme any student who fails a Biology course during second or third year will not be permitted to continue in the programme unless reinstated by the department.

In the Honours Biology and Man-Environment studies programme students must maintain a 75% average in all courses taken in the Faculty of Environmental studies and a 60% average in all Biology courses.

### Academic Programme Selection

Students entering first year in the Faculty of Science are essentially enrolled in a common year. Students in Year 1 Co-operative Biology, Chemistry, Earth Sciences and Physics are labelled as such but all other students are officially in Year 1 General Science. Essentially the same courses are available to all first year students and students may enter most Year 2 programmes in Science provided they have taken the necessary courses in Year 1 and have achieved the necessary passing average; the notable exception to this is in the Optometry programme where enrolment is limited to 60.

1) **First Year Programmes (Regular and Co-operative)**

The normal minimum course load for a full-time student in Year 1 Science is 5.0 lecture courses per term, exclusive of laboratory credits. At least two of these courses must be Faculty of Science courses and students are encouraged to select an Arts elective (preferably English or Psychology). Only students whose secondary school Year 5 average was 70% or better may select 6 lecture-courses if they wish (recommended for students intending to take an Honours Physics programme).

Courses should be chosen either with a specific Year 2 goal in mind or to cover many Year 2 programmes. The required and recommended Year 1 selections for various Year 2 Honours or General Science-Major programmes can be found in the table which follows.

2) **Course and Programme Changes**

a) Students may "add and drop" half courses during the first two weeks of the Fall, Winter and Spring terms upon having the appropriate change form completed.

b) Students may "add and drop" full-year courses during the first two weeks of the Fall term upon having the appropriate change form completed.

c) 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 one-term courses. The final drop day for full-year courses is March 1. 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.

d) 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.

e) 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) **Correspondence Courses**

Only in exceptional cases should correspondence courses be taken by a student in a semester in which he or she is a full-time student.

4) **Enrolment in a Graduate Course**

A student may obtain credit toward a graduate degree in the Faculty of Science for normally not more than one term graduate course taken during the fourth year of an undergraduate programme 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.

5) **Reduced programme**

Only in exceptional circumstances may an Honours programme be taken on a completely part-time or reduced programme basis; at least two of the upper three years must be taken on a full-time (full programme) basis and no student may spend more than 5 years of full-time study (or its equivalent) for
Academic Programme Descriptions

1. Honours Majors Programmes

Honours Biology

Year 1
(For a complete discussion of Year 1, see page 222).
(Course weight is shown in parentheses)

Students entering Year 2 must take the remaining 8
(or 7) Biology courses from the following list of 10.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biol 210</td>
<td>Introductory Invertebrate Zoology</td>
<td>0.5</td>
</tr>
<tr>
<td>Biol 211</td>
<td>Introductory Vertebrate Zoology</td>
<td>0.5</td>
</tr>
<tr>
<td>Biol 220</td>
<td>Plant Biology 1 - The Living Plant</td>
<td>0.5</td>
</tr>
<tr>
<td>Biol 221</td>
<td>Plant Biology 2 - The Diversity of Plants</td>
<td>0.5</td>
</tr>
<tr>
<td>Biol 230</td>
<td>Introductory Cell Biology</td>
<td>0.5</td>
</tr>
<tr>
<td>Biol 233</td>
<td>Human Physiology</td>
<td>0.5</td>
</tr>
<tr>
<td>Biol 239</td>
<td>Genetics</td>
<td>0.5</td>
</tr>
<tr>
<td>Biol 240</td>
<td>Fundamentals of Microbiology</td>
<td>0.5</td>
</tr>
<tr>
<td>Biol 241</td>
<td>Introduction to the Microbial World</td>
<td>0.5</td>
</tr>
<tr>
<td>Biol 250</td>
<td>Ecology</td>
<td>0.5</td>
</tr>
<tr>
<td>Chem 266</td>
<td>Basic Organic Chemistry 2</td>
<td>0.5</td>
</tr>
<tr>
<td>Chem 266L</td>
<td>Organic Chemistry Laboratory</td>
<td>0.25</td>
</tr>
<tr>
<td>Chem 267</td>
<td>Basic Organic Chemistry 3</td>
<td>0.5</td>
</tr>
<tr>
<td>Chem 237</td>
<td>Introductory Biochemistry</td>
<td>0.5</td>
</tr>
<tr>
<td>Chem 237L</td>
<td>Introductory Biochemistry Laboratory</td>
<td>0.25</td>
</tr>
<tr>
<td>Stat 202</td>
<td>Elementary Statistics for Biologists</td>
<td>0.5</td>
</tr>
</tbody>
</table>

One non-Biol elective (half-credit) (0.5)

Year 2†

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biol 331</td>
<td>Vertebrate Zoology</td>
<td>0.5</td>
</tr>
<tr>
<td>Biol 332</td>
<td>Arthropod Zoology</td>
<td>0.5</td>
</tr>
<tr>
<td>Biol 333</td>
<td>Invertebrate Zoology</td>
<td>0.5</td>
</tr>
<tr>
<td>Biol 334</td>
<td>The Flowering Plants</td>
<td>0.5</td>
</tr>
<tr>
<td>Biol 335</td>
<td>Identification and Variety of Microorganisms</td>
<td>0.5</td>
</tr>
<tr>
<td>Biol 337</td>
<td>Microorganisms in Foods</td>
<td>0.5</td>
</tr>
<tr>
<td>Biol 338</td>
<td>Plant Anatomy &amp; Morphogenesis</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Plus at least two full credits from

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biol 340</td>
<td>Molecular Biology</td>
<td>0.5</td>
</tr>
<tr>
<td>Biol 341</td>
<td>Cell Physiology</td>
<td>0.5</td>
</tr>
<tr>
<td>Biol 343</td>
<td>Histology and Cytology</td>
<td>0.5</td>
</tr>
<tr>
<td>Biol 345</td>
<td>Plant Physiology</td>
<td>0.5</td>
</tr>
</tbody>
</table>

continued on page 224
Year 1 Science Programme Selections Leading to Year 2 Honours or Major Programmes

<table>
<thead>
<tr>
<th>Major Field of Study</th>
<th>Required Courses in Year 1</th>
<th>Recommended Electives in Year 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology (see Note 6)</td>
<td>Two 200 level term courses in Biology, Chemistry 123-124 and 123L-124L</td>
<td>Physics 111-112, AM 101-111 or Math 113, Earth Sciences 121-122, Computer Science 118</td>
</tr>
<tr>
<td>Biology and Chemistry (see Note 6)</td>
<td>Two 200 level term courses in Biology, Mathematics 113, Chemistry 123-124 and 123L-124L, a first year Physics course</td>
<td></td>
</tr>
<tr>
<td>Biology and Man Environment (See Note 6)</td>
<td>Two 200-level term courses in Biology, Environmental Studies 195a or 195b, Man Environment 150-151, and 190-191, Chemistry 123-124 and 123L-124L, Computer Science 116 or 118.</td>
<td></td>
</tr>
<tr>
<td>Chemistry (see Note 2)</td>
<td>Chemistry 123-124 and 123L-124L, Mathematics 113, Physics 121-122 and 121L-122L</td>
<td>Biol 111-112, 111L-112L or two 200 level term courses in Biology, Earth Sciences 121-122, Environmental Studies 195 a or b or a Computer Science course</td>
</tr>
<tr>
<td>Chemistry (Environmental; Studies Option) (See Notes 2 &amp; 6)</td>
<td>Chemistry 123-124 and 123L-124L, Mathematics 113, Physics 121-122 and 121L-122L</td>
<td>A Computer Science course</td>
</tr>
<tr>
<td>Chemistry (Mathematics Option (see Note 2)</td>
<td>Chemistry 123-124 and 123L-124L, Mathematics 115a-115b, Physics 121-122 and 121L-122L, a first-year Algebra course (Math 111a-124b recommended)</td>
<td>A full-year Algebra course</td>
</tr>
<tr>
<td>Chemistry (Physics Option) (see Note 2)</td>
<td>Chemistry 123-124 and 123L-124L, Mathematics 113, Physics 121-122 and 121L-122L or 162-163 and 162L-163L</td>
<td>Biol 111-112 or two 200 level term courses in Biology, Earth Sciences 116, or Arts elective</td>
</tr>
<tr>
<td>Earth Sciences (see Note 4)</td>
<td>Earth Sciences 121-122, Chemistry 123-124 and 123L-124L, a first year Physics course with labs, Math 113</td>
<td>Computer Science 118</td>
</tr>
<tr>
<td>Earth Sciences (Geography Option)</td>
<td>Earth Sciences 121-122, Chemistry 123-124 and 123L-124L, Geography 102 and one of: Geography 101, 125R, 126R, 127 or Environmental Studies 195</td>
<td></td>
</tr>
<tr>
<td>Optometry (see Note 3, page 223 and consult page 239 for full list of prerequisites for admission to Optometry.)</td>
<td>Mathematics 113, Biology 230 and 211, Physics 121-122 and 121L-122L Psychology 101</td>
<td>Chemistry 123-124 and 123L-124L, Psychology 102(a-d) or Sociology 101</td>
</tr>
<tr>
<td>Physics (see Note 1)</td>
<td>Mathematics 111a and Math 111b or 113, Math 124b or Math 134b, Physics 121-122 and 121L-122L</td>
<td>A computer course</td>
</tr>
<tr>
<td>Psychology (see Note 6)</td>
<td>Two 200 level term courses in Biology, Chemistry 123-124 and 123L-124L, Physics 111-112 or 121-122 and 121L-122L, Mathematics 113, Psychology 101-102(a-d)</td>
<td></td>
</tr>
<tr>
<td>General Science &amp; Business (see pg. 246)</td>
<td>2.0 Science lecture credits from the Year 1 departmental courses, Mathematics 113, Economics 101, 102, Computer Science 116 and 115 (see pg. 246)</td>
<td></td>
</tr>
<tr>
<td>Major Field of Study</td>
<td>Required Courses in Year 1</td>
<td>Recommended Electives in Year 1</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>---------------------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Applied Physics (see Note 1)</td>
<td>Mathematics 111A and Math 111B or Math 124B or Math 134B, 115A-115B, Physics 121-122 and 121L-122L or 162-163 and 162L-163L.</td>
<td></td>
</tr>
<tr>
<td>Applied Earth Sciences (Geology Option) (see Note 4)</td>
<td>Earth Sciences 121-122, Chemistry 123-124 and 123L-124L, a first year Physics course with labs, Mathematics 113.</td>
<td>Biol 111-112 or two 200 level term courses in Biology, Computer Science 118, or Arts elective.</td>
</tr>
<tr>
<td>Applied Earth Sciences (Geotechnical Option) (see Note 4)</td>
<td>Earth Sciences 121-122, Mathematics 110A-110B, 114, Phys 111 or Phys 121-121L and GenE 112 or Phys 122-122L, Chemistry 123-124 and 123L-124L, Computer Science 118, one term arts elective.</td>
<td></td>
</tr>
<tr>
<td>Applied Earth Sciences (Geophysics Option)</td>
<td>Mathematics 113, Physics 121-122 and 121L-122L, Earth Sciences 121-122, Chemistry 123-124 and 123L-124L, Computer Science 118 (or 140), Mathematics 114 (or 110), elective.</td>
<td></td>
</tr>
<tr>
<td>Co-operative Biology (see Note 6)</td>
<td>Two 200 level term courses in Biology, Chemistry 123-124 and 123L-124L.</td>
<td>Physics 111-112, AM 101-111 Earth Sciences 121-122 and Computer Science 118.</td>
</tr>
</tbody>
</table>

Note 1
Co-op Physics students and those planning to enroll in Honours Physics in Year 2 are advised to select Math 130A-130B instead of Math 113 or 115A-115B, and may select Math 134 instead of Math 111 if they have an 80% average in Grade 13 Mathematics and Physics.

Students wishing a Biophysics option of the Honours Physics program are advised to include Biology 111-112, 111L-112L in their program.

Students wishing a geophysics option of the Honours Physics program are advised to include Earth 121-122 and Chem 123-124 in Year 1.

Students wishing any of the Business Administration options are advised to select Econ 101-102.

Students wishing an elective programme with EI E are advised to select Sy De 183 or Gen E 115 (Fall term) and CS 118 (Winter term).

Students wishing to proceed in a Theoretical Physics programme are advised to take a computing course in year 1.

Note 2
The year 2 honours chemistry programmes (including Co-op Applied Chemistry) are normally limited to the 100 best qualified students. Those who have failed core courses should not expect to proceed in any honours chemistry programme.

Note 3
Students planning to apply for admission to Year 1 Optometry should have a sound background in Chemistry. Chem 123-124 and 123L-124L is strongly recommended. Physics 162-163 and 162L-163L may be taken instead of Phys 122-122 and 121L-122L.

Note 4
By the end of Year 2 students, must have completed Phys 111-112 and Phys 111L-112L, General Physics, or Physics 121-122 and 121L-122L, Math 113, Calculus; and Computer Science 118 or an equivalent course.

In the event of the need to limit enrolment in Honours Earth Sciences programmes, preference will be given to the most qualified students.

Note 5
Students in the co-operative Applied Chemistry and Physics programmes have two methods of taking Year 1: (i) two terms in a row (September-April) or (ii) fall term on campus (September-December), winter term at work (January-April) and spring term on campus (April-August). Since no first-year Biology or Earth Sciences courses are offered in the Spring term (April-August), only students who plan to take two terms in a row may elect these courses. Sci 100, a one-term introductory geology course, is available in the Fall and Winter terms.

Note 6
The Department of Biology offers ten introductory courses which provide a thorough and broadly based foundation in biology. Areas of biology that are covered include botany (220-221), cell biology (230), ecology (250), genetics (239), microbiology (240-241), physiology (233) and zoology (210-211). First-year students must take any two of these courses (and may take three), along with Year 1 Chemistry, as prerequisites for entering Year 2 of a Biology-major programme. Students entering First Year are advised to choose courses from different areas of biology. Students from other faculties and departments are provided with a wide selection of introductory courses in diverse fields of biology from which they may choose those most suitable for their programme or area of interest.

In Year 2, students pursuing the Honours Biology programme must take the remaining 8 (or 7) biology courses and complete the Calendar requirements in Chemistry and Statistics. Students who proceed into Years 3 and 4 of the Honours Biology programme may then specialize in those areas of biology most closely related to their needs and interests.

For students who do not intend to major in Biology or enter the School of Optometry and wish to obtain a general introduction to biology. Biol 111 and 112 (and labs) are available. These courses will emphasize basic principles.

See course descriptions in Chapter 15.
Honours Biology, continued from p. 221)

Biol 346 Population Ecology 1 (0.5)
Biol 347 Mycology 1 (0.5)
Biol 348 Vertebrate Physiology 1 (0.5)
Biol 349 Vertebrate Physiology 2 (0.5)
Biol 350 Environmental Toxicology 1 (0.5)
   Plus

Electives Chemistry courses † and Phys 301 (0.5) or Phys 302 (0.5) are recommended.

†In order to graduate in the Honours Biology programme a student must take at least 1 term of biochemistry (Chem 237 & 237L, or 332 & 332L) and 1 term of organic chemistry beyond Year 1.

Students who plan to specialize in areas of Biology with a substantial Biochemical component should plan to take Biochemistry in Years 3 and 4. They are advised to take Organic Chemistry 267 in their second year and to select, as electives, Biochemistry, 332-333, 332L, 333L in their third year and other Biochemistry courses in fourth year. Other students are advised to take Chem 237-237L in their second year. Students in this latter 'stream' who subsequently wish more Biochemistry should be prepared to take Organic Chem 267 as an elective before taking Chem 333.

††Students may select only two of the three Zoology courses offered (i.e. Biol 331, 332, 333). Those wishing to take the third course may do so as part of their fourth year programme or as an elective.

Year 4†††
5 full courses of which at least 3 must be Biol 400-level courses. This year is designed to be the specialist year. The course selection should reflect this and must form an integrated group around a particular area of interest. (Chem 432-433 is recommended.)

†††All Honours Biol students who have completed their third year are required to participate in an off-campus field course (Biol 497 or 498) before entering Year 4; the cost will range between $100 and $500 per student. All students must fulfill this field course requirement to obtain their BSc Honours degree in this programme.

Note regarding Electives
A listing of Science and other electives is found on page 244. Although this list was prepared for the General Science programme many of the courses would be suitable here. Other Honours level courses in Chemistry, Physics or Psychology should also be considered.

Co-operative Biology
The University of Waterloo offers a co-operative Biology programme 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 programme has academic and work terms scheduled as shown in Chapter 5.

In-course academic requirements are the same as for Honours Biology. During the work terms, students are assessed on their performance and are also required to write work reports. The programme is aimed at making the student competitive in the job market without precluding entry into graduate school.

Honours Biology and Chemistry
(Preparations are being made to offer this programme on a co-operative basis as well in 1981-82. Ask for further information at the Science Undergraduate Office.)

Year 1
Normal Year 1 Science (see page 222) in which Chem 123-124, 123L-124L, two 200 level term courses in Biology (see Note 6 on pg. 223), a first year Physics course and Math 113 are required; (Course weight is shown in parentheses)

Year 2
Two full Biology credits from
Biol 210 Introductory Invertebrate Zoology (0.5)
Biol 211 Introductory Vertebrate Zoology (0.5)
Biol 220 Plant Biology 1 - The Living Plant (0.5)
Biol 221 Plant Biology 2 - The Diversity of Plants (0.5)
Biol 230 Introductory Cell Biology (0.5)
Biol 233 Human Physiology (0.5)
Biol 239 Genetics (0.5)
Biol 240 Fundamentals of Microbiology (0.5)
Biol 241 Introduction to the Microbial World (0.5)
Biol 250 Ecology (0.5)
   Plus

Chem 212 Structure and Bonding (0.5)
Chem 220  Introductory Analytical Chemistry (0.5)
Chem 220L Analytical Chemistry Laboratory 1 (0.25)
Chem 221 Analytical Chemistry of Multi-Component Systems (0.5)
Chem 221L Analytical Chemistry Laboratory 2 (0.5)
Chem 264 Organic Chemistry 2 (0.5)
Chem 265 Organic Chemistry 3 (0.5)
Chem 265L Organic Chemistry Laboratory 1 (0.25)
Elective One credit (1.0) (Math 215 (0.5) and one other term course recommended)

**Year 3†**

**Biol**
- Vertebrate Zoology (0.5)
- Arthropod Zoology (0.5)
- Invertebrate Zoology (0.5)
- The Flowering Plants (0.5)
- Identification and Variety of Microorganisms (0.5)
- Microorganisms in Foods (0.5)
- Plant Anatomy and Morphogenesis (0.5)
- Molecular Biology (0.5)
- Cell Physiology (0.5)
- Histology and Cytology (0.5)
- Plant Physiology (0.5)
- Population Ecology 1 (0.5)
- Mycology 1 (0.5)
- Vertebrate Physiology 1 (0.5)
- Vertebrate Physiology 2 (0.5)
- Environmental Toxicology 1 (0.5)

**Chem**
- Biochemistry 1 (0.5) and 2 (0.5)
- General Physical Chemistry 1 (0.5) and 2 (0.5)
- Organic Chemistry 2 (0.5)
- Organic Chemistry 3 (0.5)
- General Physical Chemistry Laboratory 1 (0.25) and 2 (0.25)
- Organic Chemistry Laboratory 2 (0.5)

†Students may select only two of the three Zoology courses offered (i.e., Biol 331, 332, 333). Those wishing to take the third course may do so as part of their fourth year programme or as an elective. Chemistry courses shown for Year 3 are for students whose Year 1 Chemistry was Chem 121-122. Next year this list will differ for students who took Chem 123-124.

**Year 4††**

**Biol**
- Any three full credits from 400-level courses offered in Biology
- Or
- Any two full credits from 400-level courses offered in Biol and Chem 492
- Transition Metal Chemistry (0.5)
- Coordination Chemistry (0.5)
- Biological Aspects of Inorganic Chemistry (0.5)
- Biochemistry 3 (0.5) and 4 (0.5)
- Biochemistry 3 (0.25) and 4 (0.25)

††The Biochemistry 432L and 433L laboratory courses are compulsory except for students who elect to do a Biochemistry 492 project. These students may choose not to do 432L/433L but, if so, they must take an extra 0.5 credit course chosen from upper level Biology or Chemistry courses and approved by an undergraduate officer in the appropriate department.

**Honours Biology and Man Environment**

Students must maintain a 75% average in all courses taken in the Faculty of Environmental Studies and a 60% average in all Biology courses.

**Year 1**

(For a complete discussion of Year 1, see page 222. Course weight is shown in parenthesis).

**Year 2†**

**Biol**
- At least one and a half credits from
  - Introductory Invertebrate Zoology (0.5)
  - Introductory Vertebrate Zoology (0.5)
  - Plant Biology 1 - The Living Plant (0.5)
  - Plant Biology 2 - The Diversity of Plants (0.5)
  - Introductory Cell Biology (0.5)
  - Human Physiology (0.5)
  - Genetics (0.5)
  - Fundamentals of Microbiology (0.5)
  - Introduction to the Microbial World (0.5)

**Chem**
- Ecology (0.5)
- Or
- Field Ecology (0.5)

**M Env**
- Seminar-Workshop (1.0)
- Development of Environmental Thought (1.0)
Env S 271  Introduction to Quantitative Research Methods (0.75)
  or
Stat 202  Elementary Statistics for Biologists (0.5)
  Plus
M Env 241  Social Change (0.5)
  Plus
Chem 266  Basic Organic Chemistry 2 (0.5)
Chem 266L  Organic Chemistry Lab (0.25)
  Plus
Chem 267  Basic Organic Chemistry 3 (0.5)
  or
Chem 237  Introductory Biochemistry (0.5)
Chem 237L  Introductory Biochemistry Lab (0.25)

†Note: Generally students will take the ecology course offered in the Faculty in which they are enrolled.
Instead of Man Env 241, students may take any course above the first year level in Anthropology, Economics, Political Science, Psychology or Sociology. Students who do not plan to specialize in areas of Biology with a substantial biochemical component are advised to take Organic Chem 266-266L and Biochem 237-237L. Other students should take a second Organic Chemistry course, Chem 267, in their second year and take Biochem 332-333 in Year 3.

Year 3

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biol 331</td>
<td>Vertebrate Zoology (0.5)</td>
</tr>
<tr>
<td>Biol 332</td>
<td>Arthropod Zoology (0.5)</td>
</tr>
<tr>
<td>Biol 333</td>
<td>Invertebrate Zoology (0.5)</td>
</tr>
<tr>
<td>Biol 334</td>
<td>The Flowering Plants (0.5)</td>
</tr>
<tr>
<td>Biol 335</td>
<td>Identification and Variety of Microorganisms (0.5)</td>
</tr>
<tr>
<td>Biol 337</td>
<td>Microorganisms in Foods (0.5)</td>
</tr>
<tr>
<td>Biol 338</td>
<td>Plant Anatomy and Morphogenesis (0.5)</td>
</tr>
<tr>
<td>Biol 340</td>
<td>Molecular Biology (0.5)</td>
</tr>
<tr>
<td>Biol 341</td>
<td>Cell Physiology (0.5)</td>
</tr>
<tr>
<td>Biol 343</td>
<td>Histology and Cytology (0.5)</td>
</tr>
<tr>
<td>Biol 345</td>
<td>Plant Physiology (0.5)</td>
</tr>
<tr>
<td>Biol 346</td>
<td>Population Ecology 1 (0.5)</td>
</tr>
<tr>
<td>Biol 347</td>
<td>Mycology 1 (0.5)</td>
</tr>
<tr>
<td>Biol 348</td>
<td>Vertebrate Physiology 1 (0.5)</td>
</tr>
<tr>
<td>Biol 349</td>
<td>Vertebrate Physiology 2 (0.5)</td>
</tr>
<tr>
<td>Biol 350</td>
<td>Environmental Toxicology 1 (0.5)</td>
</tr>
</tbody>
</table>
  Plus
M Env 390  Seminar-Workshop (1.0)
Electives  Two full credits from Biology, Chemistry or the Faculty of Environmental Studies.

Science
Academic Programmes

Year 4

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biol</td>
<td>Any three full credits from 400-level courses offered in Biology</td>
</tr>
<tr>
<td>M Env 400</td>
<td>Senior Honours Seminar (1.0)</td>
</tr>
<tr>
<td>M Env 490A</td>
<td>Senior Honours Assignment (1.0)</td>
</tr>
</tbody>
</table>

Honours Chemistry Programmes

General Information

As well as the Honours Biology and Chemistry program described above, students may take:
  Co-operative Applied Chemistry (Honours)
  Honours Chemistry
  Honours Chemistry (Physics Option)
  Honours Chemistry (Mathematics Option)
  Honours Chemistry (Environmental Studies Option)

(There is also a 4-year Honours Science degree (Programme 3) which offers less intensive specialization in chemistry, and a 4-year General Science degree with chemistry major. These are described later in this chapter of the calendar.)

Professional Standing

All five programs listed here fulfill the academic requirements for professional membership in the Chemical Institute of Canada.

Elective Courses for Chemistry Programmes

Elective courses are given subject to sufficient demand being recorded at the stated preregistration period. Table (a) lists present expectations but is subject to change. Certain specialized electives will be withdrawn if the specialist lecturer should be unavailable.
(a) Technical Electives with Chemistry Content

<table>
<thead>
<tr>
<th>COURSE NO.</th>
<th>1981 Fall</th>
<th>1982 Winter</th>
<th>SPRING</th>
<th>1983 Fall</th>
<th>1983 Winter</th>
<th>SPRING</th>
</tr>
</thead>
<tbody>
<tr>
<td>*311</td>
<td>x</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>*320</td>
<td>x</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>320L</td>
<td>x</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>332</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>332L</td>
<td>x</td>
<td>x</td>
<td></td>
<td>x</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>333</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>333L</td>
<td>x</td>
<td>x</td>
<td></td>
<td>x</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>350</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>*353</td>
<td>x</td>
<td></td>
<td>x</td>
<td>x</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>359</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>362</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>*363</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>367</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>395</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>409</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>411</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>*416</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>417</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>419</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>*420</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>*421</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>*422</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>432</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>433</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>434</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>452</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>*453</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>*454</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>*455</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>*456</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>*457</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>458</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>464</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>465</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Phys 359</td>
<td>x</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Ch E 331</td>
<td>x</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td>x</td>
</tr>
</tbody>
</table>

(Note: Courses marked with an asterisk (*) are strongly recommended for Applied Chemistry students.)

(b) Electives Relevant to Industrial Employment

The Waterloo Advisory Council suggests students contemplating careers in industry should seriously consider selecting some of the following electives:

- Statistics: Stat 204-205, Ch.E. 220
- Writing: Sci 209, Engl 210
- Environment: M.Env 320
- Law: Env.3 201, Econ 294, P Sci 291-292
- Management Science: MSci 44
- Business (WLU courses): 352-362, 382-383
- Economics: Econ 101-102, 201-202, 281-282
- Accounting: Econ 281-282
Co-operative Applied Chemistry (honours)

Programme Adviser: Professor H. G. McLeod

This program offers the Honours Chemistry courses integrated with six four-month work terms, and therefore extending over five years instead of four. Information about the co-operative system and the Coordination Department 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 4 together and graduate together in the spring.

The same core courses are taken as in the Honours Chemistry program. There may be some variations in the sequence of certain courses between the two streams. The course sequences are set out below.

Co-operative Applied Chemistry

Year 1
Normal Year 1 Science including Chem 123-124, 123L-124L, Phys 121-122, 121L-122L, Math 115a/b

Programs for students whose Year 1 Chemistry was Chem 121-122 (up to 1979-1980):

Stream 8 (students who took 1B term in the winter)

<table>
<thead>
<tr>
<th>Fall</th>
<th>Winter</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work Term</td>
<td>Year 3A</td>
<td>Work Term</td>
</tr>
<tr>
<td></td>
<td>Chem 10, 313, 314L, 355, 355L, 364, 364L</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Two electives</td>
<td></td>
</tr>
<tr>
<td>Year 3B</td>
<td>Work Term</td>
<td>Work Term</td>
</tr>
<tr>
<td>Chem 10, 312, 315L, 358, 358L, 365</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Two electives *</td>
<td></td>
</tr>
</tbody>
</table>

Stream 4 (students who took 1B term in the spring)

<table>
<thead>
<tr>
<th>Fall</th>
<th>Winter</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 2B</td>
<td>Work Term</td>
<td>Year 3A</td>
</tr>
<tr>
<td></td>
<td>Phys 243, 243L</td>
<td></td>
</tr>
<tr>
<td></td>
<td>One elective</td>
<td>One elective *</td>
</tr>
<tr>
<td>Work Term</td>
<td>Year 3B</td>
<td>Work Term</td>
</tr>
<tr>
<td>Chem 10, 313, 315L, 358, 358L</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Three electives *</td>
<td></td>
</tr>
</tbody>
</table>

Programs for students whose Year 1 Chemistry was Chem 123-124 (in and after 1980-1981):

Stream 8 (students who took 1B term in the winter)

<table>
<thead>
<tr>
<th>Fall</th>
<th>Winter</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 2A</td>
<td>Work Term</td>
<td>Year 2B</td>
</tr>
<tr>
<td>Chem 10, 212, 220, 220L, 254, 264L</td>
<td></td>
<td>Chem 10, 221, 221L, 255, 265, 265L</td>
</tr>
<tr>
<td></td>
<td>Math 215</td>
<td></td>
</tr>
<tr>
<td>Work Term</td>
<td>Year 3A</td>
<td>Work Term</td>
</tr>
<tr>
<td></td>
<td>Chem 10, 313, 314L, 355, 355L, 364, 364L</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Two electives</td>
<td></td>
</tr>
</tbody>
</table>

Stream 4 (students who took 1B term in the spring)

<table>
<thead>
<tr>
<th>Fall</th>
<th>Winter</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 2B</td>
<td>Work Term</td>
<td>Year 3A</td>
</tr>
<tr>
<td></td>
<td>Phys 243, 243L</td>
<td></td>
</tr>
<tr>
<td></td>
<td>One elective</td>
<td>One elective *</td>
</tr>
<tr>
<td>Work Term</td>
<td>Year 3B</td>
<td>Work Term</td>
</tr>
<tr>
<td>Chem 10, 313, 315L, 358, 358L</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Three electives *</td>
<td></td>
</tr>
</tbody>
</table>
Regardless of which Year 1 sequence was taken, for all students in both streams:

<table>
<thead>
<tr>
<th>Year 4</th>
<th>(Fall and Winter)</th>
<th>Chem 10</th>
<th>Eight electives*</th>
<th>Chem 492</th>
</tr>
</thead>
</table>

Notes*

*In Years 3 and 4, at least six of the electives chosen must be from the list of Technical Electives with Chemistry Content, of which at least four must be at 400 level.

Offerings of new courses listed in the revised programs above will begin when the progress of the class which entered in 1980 requires them.

Honours Chemistry

Programme Adviser: Professor G.E. Toogood

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Normal Year 1 Science (see page 222) including Chem 123-123L, 124-124L, Math 113 and Phys 121-122, 121L-122L.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Year 2</th>
<th>Fall Term</th>
<th>Winter Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chem 10</td>
<td>Chemistry Seminar</td>
<td>Chem 10 Chemistry Seminar</td>
</tr>
<tr>
<td>Chem 212</td>
<td>Structure and Bonding (0.5)</td>
<td>Chem 313 Main Group Chemistry (0.5)</td>
</tr>
<tr>
<td>Chem 220</td>
<td>Introductory Analytical Chemistry (0.5)</td>
<td>Chem 315L Inorganic Chemistry Laboratory 2 (0.5)</td>
</tr>
<tr>
<td>Chem 220L</td>
<td>Analytical Chemistry Laboratory 1 (0.25)</td>
<td>Chem 358 Physical Chemistry 4 (0.5)</td>
</tr>
<tr>
<td>Chem 254</td>
<td>Physical Chemistry 1 (0.5)</td>
<td>Chem 358L Physical Chemistry Laboratory 2 (0.5)</td>
</tr>
<tr>
<td>Chem 264</td>
<td>Organic Chemistry 2 (0.5)</td>
<td>Chem 365 Organic Chemistry 3 (0.5)</td>
</tr>
<tr>
<td>Math 215</td>
<td>Differential Equations (0.5)</td>
<td>Two electives† (1.0)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 3</th>
<th>Fall Term</th>
<th>Winter Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chem 10</td>
<td>Chemistry Seminar</td>
<td>Chem 10 Chemistry Seminar</td>
</tr>
<tr>
<td>Chem 312</td>
<td>Transition Metal Chemistry (0.5)</td>
<td>Chem 212 Structure and Bonding (0.5)</td>
</tr>
<tr>
<td>Chem 314L</td>
<td>Inorganic Chemistry Laboratory 1 (0.25)</td>
<td>Chem 220 Introductory Analytical Chemistry (0.5)</td>
</tr>
<tr>
<td>Chem 355</td>
<td>Physical Chemistry 3 (0.5)</td>
<td>Chem 220L Analytical Chemistry Laboratory 1 (0.25)</td>
</tr>
<tr>
<td>Chem 355L</td>
<td>Physical Chemistry Laboratory 1 (0.25)</td>
<td>Chem 254 Physical Chemistry 1 (0.5)</td>
</tr>
</tbody>
</table>

* To be offered for the last time in 1981-82. For students whose first year chemistry was Chemistry 121-122.

Honours Chemistry (Environmental Studies Option)

Programme Adviser: Professor J.G. Smith

This programme supplements the Honours Chemistry core with courses to familiarize the student with legal, economic and social aspects of environmental control and resource management.

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Normal Year 1 Science (see page 222) including Chem 123-123L, 124-124L, Math 113, and Phys 121-122, 121L-122L.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Year 2</th>
<th>Fall Term</th>
<th>Winter Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chem 10</td>
<td>Chemistry Seminar</td>
<td>Chem 10 Chemistry Seminar</td>
</tr>
<tr>
<td>Chem 312</td>
<td>Transition Metal Chemistry (0.5)</td>
<td>Chem 212 Structure and Bonding (0.5)</td>
</tr>
<tr>
<td>Chem 314L</td>
<td>Inorganic Chemistry Laboratory 1 (0.25)</td>
<td>Chem 220 Introductory Analytical Chemistry (0.5)</td>
</tr>
<tr>
<td>Chem 355</td>
<td>Physical Chemistry 3 (0.5)</td>
<td>Chem 220L Analytical Chemistry Laboratory 1 (0.25)</td>
</tr>
<tr>
<td>Chem 355L</td>
<td>Physical Chemistry Laboratory 1 (0.25)</td>
<td>Chem 254 Physical Chemistry 1 (0.5)</td>
</tr>
<tr>
<td>Math 215</td>
<td>Differential Equations (0.5)</td>
<td>Chem 264 Organic Chemistry 2 (0.5)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 3</th>
<th>Fall Term</th>
<th>Winter Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chem 10</td>
<td>Chemistry Seminar</td>
<td>Chem 10 Chemistry Seminar</td>
</tr>
<tr>
<td>Chem 312</td>
<td>Transition Metal Chemistry (0.5)</td>
<td>Chem 212 Structure and Bonding (0.5)</td>
</tr>
<tr>
<td>Chem 314L</td>
<td>Inorganic Chemistry Laboratory 1 (0.25)</td>
<td>Chem 220 Introductory Analytical Chemistry (0.5)</td>
</tr>
<tr>
<td>Chem 355</td>
<td>Physical Chemistry 3 (0.5)</td>
<td>Chem 220L Analytical Chemistry Laboratory 1 (0.25)</td>
</tr>
<tr>
<td>Chem 355L</td>
<td>Physical Chemistry Laboratory 1 (0.25)</td>
<td>Chem 254 Physical Chemistry 1 (0.5)</td>
</tr>
</tbody>
</table>

Chem 364* Organic Chemistry 2 (0.5)
Chem 364L Organic Chemistry Laboratory 2 (0.5)
Two electives† (1.0)

Chem 364* Organic Chemistry 2 (0.5)
Chem 364L Organic Chemistry Laboratory 2 (0.5)
Two electives† (1.0)
### Year 1

**Fall Term**
- **Chem 10** Chemistry Seminar
- **Chem 312** Transition Metal Chemistry (0.5)
- **Chem 314A** Inorganic Chemistry Laboratory 1 (0.25)
- **Chem 355** Physical Chemistry 3 (0.5)
- **Chem 355L** Physical Chemistry Laboratory 1 (0.25)
- **Chem 364** Organic Chemistry 2 (0.5)
- **Chem 364L** Organic Chemistry Laboratory 2 (0.5)
- **Stat 204** Statistics for the Sciences (0.5)
- One elective (0.5)

**Winter Term**
- **Chem 10** Chemistry Seminar
- **Chem 313** Main Group Chemistry (0.5)
- **Chem 315A** Inorganic Chemistry Laboratory 2 (0.5)
- **Chem 358** Physical Chemistry 4 (0.5)
- **Chem 358L** Physical Chemistry Laboratory 2 (0.5)
- **Chem 365** Organic Chemistry 3 (0.5)
- **Stat 205** Statistics for the Sciences (0.5)
- One elective (0.5)

*To be offered for the last time in 1981-82. For students whose first year chemistry was Chem 121-122.*

### Year 2

**Fall Term**
- **Chem 10** Chemistry Seminar
- **Chem 212** Structure and Bonding (0.5)
- **Chem 220** Introductory Analytical Chemistry (0.5)
- **Chem 220L** Analytical Chemistry Laboratory 1 (0.25)
- **Chem 254** Physical Chemistry 1 (0.5)
- **Chem 264** Organic Chemistry 2 (0.5)

### Honours Chemistry (Mathematics Option)

**Programme Adviser:** Professor F.R. McCourt

This programme 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.

### Year 4

**Chem 123-124 and 123L-124L, Physics 121-122 and 121L-122L, Math 115a and 115b and an Algebra course (Math 111a and 124b recommended). One term of Computer Science also recommended.**
Math 216  Differential Equations (0.5)

One of:
Math 230a, 221a, 231a, 213a (0.5)

Winter Term
Chem 10    Chemistry Seminar
Chem 221   Analytical Chemistry of Multi-Component Systems (0.5)
Chem 221L  Analytical Chemistry Laboratory 2 (0.5)
Chem 255   Physical Chemistry 2 (0.5)
Chem 265   Organic Chemistry 3 (0.5)
Chem 265L  Organic Chemistry Laboratory 1 (0.25)
Phys 243   Electricity and Magnetism (0.5)
Phys 243L  Electricity and Magnetism Laboratory (0.25)

One of:
Math 230b, 221b, 231b, 213b, CS370 (0.5)

<table>
<thead>
<tr>
<th>Year 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall Term</strong></td>
</tr>
<tr>
<td>Chem 10    Chemistry Seminar</td>
</tr>
<tr>
<td>Chem 312   Transition Metal Chemistry (0.5)</td>
</tr>
<tr>
<td>Chem 314L  Inorganic Chemistry Laboratory 1 (0.25)</td>
</tr>
<tr>
<td>Chem 355   Physical Chemistry 3 (0.5)</td>
</tr>
<tr>
<td>Chem 355L  Physical Chemistry Laboratory 1 (0.25)</td>
</tr>
<tr>
<td>Chem 364*  Organic Chemistry 2 (0.5)</td>
</tr>
<tr>
<td>Chem 364L  Organic Chemistry Laboratory 2 (0.5)</td>
</tr>
</tbody>
</table>

One of:
Math 322a, AM 260, 387 (0.5)
plus
One elective (0.5)

<table>
<thead>
<tr>
<th>Winter Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chem 10    Chemistry Seminar</td>
</tr>
<tr>
<td>Chem 313   Main Group Chemistry (0.5)</td>
</tr>
<tr>
<td>Chem 315L  Inorganic Chemistry Laboratory 2 (0.25)</td>
</tr>
<tr>
<td>Chem 358   Physical Chemistry 4 (0.5)</td>
</tr>
<tr>
<td>Chem 358L  Physical Chemistry Laboratory 2 (0.5)</td>
</tr>
<tr>
<td>Chem 365   Organic Chemistry 3 (0.5)</td>
</tr>
</tbody>
</table>

One of:
Math 322b, 331, AM 371, 391, 395 (0.5)
plus
One elective (0.5)

* To be offered for the last time in 1981-82. For students whose first year chemistry was Chem 121-122.

<table>
<thead>
<tr>
<th>Year 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall Term</strong></td>
</tr>
<tr>
<td>Chem 10    Chemistry Seminar</td>
</tr>
<tr>
<td>Chem 492   Advanced Laboratory (1.5)</td>
</tr>
<tr>
<td>Four one-term Chem courses, at least two at 400-level. (2.0)</td>
</tr>
<tr>
<td>Four one-term (or equivalent) Math courses at 300- or 400-level. (2.0)</td>
</tr>
</tbody>
</table>

Honours Chemistry (Physics Option)

*Programme Adviser: Professor G. Scales
This programme 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.

<table>
<thead>
<tr>
<th>Year 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal Year 1 Science including Chem 123-124 and 123L-124L, Phys 121-122 or 162-163, and Phys 121L-122L or 162L-163L, Math 113. A course in Algebra and a term of Computer Science is also recommended.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall Term</strong></td>
</tr>
<tr>
<td>Chem 10    Chemistry Seminar</td>
</tr>
<tr>
<td>Chem 212   Structure and Bonding (0.5)</td>
</tr>
<tr>
<td>Chem 220   Introductory Analytical Chemistry (0.5)</td>
</tr>
<tr>
<td>Chem 220L  Analytical Chemistry Laboratory 1 (0.25)</td>
</tr>
<tr>
<td>Chem 254   Physical Chemistry 1 (0.5)</td>
</tr>
<tr>
<td>Chem 264   Organic Chemistry 2 (0.5)</td>
</tr>
<tr>
<td>Math 210   Calculus 2 (0.5)</td>
</tr>
<tr>
<td>Phys 222   Electricity and Magnetism 1 (0.5)</td>
</tr>
</tbody>
</table>
or 252
| Phys 222L  Electricity and Magnetism Laboratory 1 (0.25) |

<table>
<thead>
<tr>
<th>Winter Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chem 10    Chemistry Seminar</td>
</tr>
<tr>
<td>Chem 221   Analytical Chemistry of Multi-Component Systems (0.5)</td>
</tr>
<tr>
<td>Chem 221L  Analytical Chemistry Laboratory 2 (0.5)</td>
</tr>
<tr>
<td>Chem 255   Physical Chemistry 2 (0.5)</td>
</tr>
<tr>
<td>Chem 265   Organic Chemistry 3 (0.5)</td>
</tr>
<tr>
<td>Chem 265L  Organic Chemistry Laboratory 1 (0.25)</td>
</tr>
<tr>
<td>Math 215   Differential Equations (0.5)</td>
</tr>
<tr>
<td>Phys 223   Electricity and Magnetism 2 (0.5)</td>
</tr>
</tbody>
</table>
or 253
| Phys 223L  Electricity and Magnetism Laboratory 2 (0.25) |

<table>
<thead>
<tr>
<th>Year 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall Term</strong></td>
</tr>
<tr>
<td>Chem 10    Chemistry Seminar</td>
</tr>
<tr>
<td>Chem 312   Transition Metal Chemistry (0.5)</td>
</tr>
<tr>
<td>Chem 314L  Inorganic Chemistry Laboratory 1 (0.25)</td>
</tr>
<tr>
<td>Chem 355   Physical Chemistry 3 (0.5)</td>
</tr>
<tr>
<td>Chem 355L  Physical Chemistry Laboratory 1 (0.25)</td>
</tr>
<tr>
<td>Chem 364*  Organic Chemistry 2 (0.5)</td>
</tr>
<tr>
<td>Chem 364L  Organic Chemistry Laboratory 2 (0.5)</td>
</tr>
<tr>
<td>Phys 324   Atomic and Nuclear Physics 1 (0.5)</td>
</tr>
<tr>
<td>One Elective (0.5)</td>
</tr>
</tbody>
</table>
Winter Term

Chem 10 Chemistry Seminar
Chem 313 Main Group Chemistry (0.5)
Chem 315L Inorganic Chemistry Laboratory 2 (0.25)
Chem 358 Physical Chemistry 4 (0.5)
Chem 358L Physical Chemistry Laboratory 2 (0.5)
Chem 365 Organic Chemistry 3 (0.5)
Phys 325 Atomic and Nuclear Physics 2 (0.5)
One Elective† (0.5)

†To be offered for the last time in 1981-82.
For students whose Year 1 chemistry was Chem 121-122.

†Year 3 electives may be chosen from Phys 352-353 plus 352L-353L, 362-363, 364-365, Math 221a-221b, 222b, CS370.

Year 4

Chem 10 Chemistry Seminar
Chem 492 Advanced Laboratory (1.5)
Two one-term Chemistry courses which must be at the 400-level. (1.0)
Four one-term Physics courses at the 300- or 400 level. (2.0)
Two one-term electives. (1.0)

Honours Earth Sciences

Completion of this programme requires a total of 24.0 credits (including year one). Of these at least two elective credits must be from the Faculty of Arts and at least two elective lecture credits must be non-Earth Sciences courses from the faculties of Science and Mathematics. (There are two exceptions. Earth 355 is considered only as a Science/Mathematics elective; Physics 368-369 are not considered as Science/Mathematics electives). In addition, attendance on two field trips is required (Earth 390-490).

(See Undergraduate Course Descriptions, Ch. 15)
A list of recommended Science and Mathematics electives is given on page 244.

Year 1

(For a complete discussion of Year 1, see page 222)

Year 2

Earth 221 Geochemistry 1 (0.5)
Earth 231 Mineralogy (0.5)
Earth 232 Petrography (0.5)
Earth 235 Stratigraphy (0.5)
Earth 236 Principles of Paleontology (0.5)
Earth 260 Introductory Structural Geology (0.5)
Electives Three credits, normally two from courses in Science and/or Mathematics, and one from Arts.

Note

By the end of Year 2, students must have completed Phys 111-112 and Phys 111L-112L, General Physics (or an equivalent physics course), Math 113, Calculus, and an introductory course in computer programming equivalent to CS 118 or Gen E 121.

Year 3

Earth 331 Igneous Petrology (0.5)
Earth 332 Metamorphic Petrology (0.5)
Earth 333 Sedimentology (0.5)
Earth 336 Paleontology (0.5)
Earth 342 Geomorphology (0.5)
Earth 345 Historical Geology (0.5)
Earth 360 Applied Geophysics 1 (0.5)
Earth 370 Economic Geology (0.5)
Earth 390 Field Camp
Electives Two credits, normally one from courses in Science and/or Mathematics, and one from Arts.

Year 4

Earth 490 Field trip
Earth 436 Thesis (1.0)
Earth 427 Crustal Evolution (0.5)

Seven half-credits from:

Earth 421 Geochemistry 2 (0.5)
Earth 432 Precambrian Geology (0.5)
Earth 433 Applied Sedimentology (0.5)
Earth 434 Biostratigraphy (0.5)
Earth 435 Advanced Structural Geology (0.5)
Earth 438 Engineering Geology (0.5)
Earth 439 Hydrogeology (0.5)
Earth 440 Quaternary Geology (0.5)
Earth 456 Numerical Methods in Geoscience (0.5)
Earth 461 Applied Geophysics 2 (0.5)
Earth 470 Metallic Mineral Deposits (0.5)
Electives One credit, not from Earth Sciences.

†Upon programme approval by the Undergraduate Officer, a student may take six half-credits from the above list to allow freedom to take courses in the faculties of Engineering, Mathematics or Science. Students who plan to do graduate work in hydrogeology and who have not taken the Geotechnical Option are advised to take Math 210 or Civ E 221 during their fourth year.


**Note**
The Department of Earth Sciences is prepared to work out honours programmes with students who wish to use their electives to specialize in a particular discipline; e.g. Mathematics, Biology, Chemistry, Physics.

**Honours Earth Sciences (Geography Option)**
This programme combines the basic courses of Honours Earth Sciences with Geography. Successful completion requires 13.5 credits from the Faculty of Science and 11 one-term courses from the Faculty of Environmental Studies. Students must maintain a 75% average in all Geography courses.

<table>
<thead>
<tr>
<th>Year 1</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Earth 121</td>
<td>Introductory Geology 1 (0.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Earth 122</td>
<td>Introductory Geology 2 (0.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Geog 102</td>
<td>Introduction to Physical Geography (0.75)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chem 123</td>
<td>Chemical Reactions, Equilibria &amp; Kinetics (0.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chem 123L</td>
<td>Chemical Reaction Laboratory (0.25)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chem 124</td>
<td>Organic Chemistry 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chem 124L</td>
<td>Chemical Reaction Laboratory (0.25)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Geog 101</td>
<td>Introduction to Human Geography (0.75)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Geog 125R</td>
<td>Introduction to the Developing World (0.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Geog 126R</td>
<td>Development in the Third World (0.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Geog 127</td>
<td>Regional Problems of Europe (0.75)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Env S 195</td>
<td>Introduction to Environmental Problems (0.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electives</td>
<td>Two credits</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 2</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Earth 221</td>
<td>Geochemistry 1 (0.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Earth 231</td>
<td>Mineralogy (0.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Earth 232</td>
<td>Petrography (0.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Earth 235</td>
<td>Stratigraphy (0.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Earth 236</td>
<td>Principles of Paleontology (0.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Earth 260</td>
<td>Introductory Structural Geology (0.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Env S 200</td>
<td>Field Ecology (0.75)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Geog 201</td>
<td>Some Basic Topics of Physical Geography (0.75)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Geog 202</td>
<td>Some Basic topics of Economic and Urban Geography (0.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electives</td>
<td>Three one-term equivalents including one of:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Geog 203</td>
<td>Some Basic Topics of Cultural and Regional Geography (0.75)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Geog 220</td>
<td>World Regional Geography (1.5)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note**
By the end of year 2, students must have completed an introductory course in computer programming equivalent to CS 118 or Gen E 121.

**Year 3**
- Earth 331 Igneous Petrology (0.5)
- Earth 332 Metamorphic Petrology (0.5)
- Earth 333 Sedimentology (0.5)
- Earth 336 Paleontology (0.5)
- Earth 342 Geomorphology (0.5)
- Earth 345 Historical Geology (0.5)
- Earth 370 Economic Geology (0.5)
- Geog 381 The Nature of Geography (0.5)
- Earth 390 Field Camp

**Geog Electives**
- Two one-term equivalents

**Year 4**
- Earth 436 Honours Thesis (1.0)
- Earth 490 Field Trip

**Earth Electives**
- Three credits (3.0)

**Geog Electives**
- Two one-term equivalents.

<table>
<thead>
<tr>
<th>Co-operative Applied Earth Sciences</th>
</tr>
</thead>
</table>
| The co-operative programmes in Earth Sciences are Honours programmes designed to satisfy the requirements of many potential employers that graduating geologist have practical experience as well as good academic training. In the first year students take the Year 1 Science programme as described on page 223. The co-operative Earth Sciences programmes operate as a single co-operative stream. The first work term begins in the Spring term following Year 1 and thereafter academic and work terms alternate until the end of term 3B when a double work term commences. Students then take terms 4A and 4B as a full academic year, graduating the following spring. At least one work report must have been satisfactorily completed by the beginning of academic term 3A. All four work reports must have been submitted within one month of the beginning of the academic term 4A. Transfer to a regular honours programme will be permitted if all requirements of the Co-op programme have been met up to the time of the transfer.

General features and conditions of the co-operative plan at the University of Waterloo are given in Chapter 5.

The normal progress of a student entering co-operative Earth Sciences in the Fall of 1981 is shown in the table page 61, Chapter 5. There are three programmes available: the Geology, Geophysics and the Geotechnical option. Students contemplating careers in engineering geology or hydrogeology are advised to take the Geotechnical Option.
Geology Option

Completion of this course requires a total of 24.0 credits (including year one). Of these at least 2 lecture-credits (excluding required courses) must be non-Earth Sciences courses from the faculties of Science and Mathematics and 2 credits must be from the Faculty of Arts. (There are two exceptions, Earth 355 is considered only as a Science/Mathematics elective; Physics 368-369 are not considered as Science/Mathematics electives.) In addition, attendance is required on two field trips (Earth 390, Earth 490) (see Undergraduate Course Descriptions, Ch. 15). A list of recommended Science and Mathematics electives is given on page 244.

Year 2A
Earth 231 Mineralogy (0.5)
Earth 235 Stratigraphy (0.5)
Earth 236 Principles of Paleontology (0.5)
Electives Three half credits, normally two from courses in Science and/or Mathematics and one from Arts. (1.5)

Year 2B
Earth 221 Geochemistry 1 (0.5)
Earth 232 Petrography (0.5)
Earth 260 Introductory Structural Geology (0.5)
Electives Three half credits, normally two from courses in Science and/or Mathematics and one from Arts. (1.5)

Note
By the end of Year 2, students must have completed Phys 111-112 and Phys 111L-112L, General Physics (or an equivalent physics course), Math 113, Calculus, and a course involving computer programming equivalent to CS 118 or Gen E 121.

Year 3A
Earth 332 Metamorphic Petrology (0.5)
Earth 333 Sedimentology (0.5)
Earth 345 Historical Geology (0.5)
Earth 370 Economic Geology (0.5)
Earth 390 Field Camp
Electives Two half credits, normally one from Science or Mathematics and one from Arts. (1.0)

Year 3B
Earth 331 Igneous Petrology (0.5)
Earth 336 Paleontology (0.5)
Earth 342 Geomorphology (0.5)
Earth 360 Applied Geophysics 1 (0.5)
Electives Two half credits, normally one from Science or Mathematics and one from Arts.

Year 4A,4B
Identical to regular programme in Honours Earth Sciences.

Geophysics Option

This is a co-operative programme which supplements the core geology courses with physics and mathematics and is intended for students planning careers in geophysical exploration. This option differs from the Geophysics option offered by the Physics Department (p. 000) in that its main emphasis is geological, but the two programmes are supervised by a Geophysics Curriculum Committee comprised of faculty from both departments.

Attendance is required on the field trips Earth 390 and Earth 490.

Year 2A
Earth 231 Mineralogy (0.5)
Earth 235 Stratigraphy (0.5)
Earth 360 Applied Geophysics (0.5)
Math 213A Calculus 2 (0.5)
Math 216 Differential Equations (0.5)
Physics 256 Wave motion and Optics (0.5)

Year 2B
Earth 221 Geochemistry 1 (0.5)
Earth 232 Petrography (0.5)
Earth 260 Introductory Structural Geology (0.5)
Math 213B Calculus 2 (0.5)
Physics 243 Electricity and Magnetism (0.5)
Elective (0.5)

Year 3A
Earth 332 Metamorphic Petrology (0.5)
Earth 333 Introductory Sedimentology (0.5)
Earth 345 Historical Geology (0.5)
Earth 370 Economic Geology (0.5)
Earth 390 Field Camp
Physics 369 Geophysics 2 (0.5)
Elective (0.5)

Year 3B
Earth 331 Igneous Petrology (0.5)
Earth 342 Geomorphology (0.5)
Physics 368 Geophysics 1 (0.5)
Physics 254 Properties of matter (0.5)
Elective (0.5)

Year 4
Earth 427 Crustal Evolution (0.5)
Earth 436 Honours Thesis (1.0)
Earth 461 Geophysics 2 (0.5)
Earth 490 Field trip (0.5)
Physics 352 Electronics 1 (0.5)
Physics 352L Electronics 1 Laboratory (0.25)
Physics 353 Electronics 2 (0.5)
Physics 353L Electronics 2 Laboratory (0.25)
Plus 2.5 Earth Sciences credits from 4th year courses
Geotechnical Option
This co-operative programme follows the same timetable as the geology option described above. The course selection has been made with both the traditional geology and the geotechnical professions in mind. As such it also provides a good undergraduate background for fields such as engineering geology and hydrogeology. The number of students admitted to this programme is limited. Students wishing to enter the Geotechnical Option must have either a 70% average in mathematics and physics or the permission of the undergraduate admissions committee.

In addition to the prescribed course work, attendance is required on two Earth Sciences field trips (Earth 390-490) see Undergraduate Course Description, Ch. 15) and in Civ E 291, a non-credit field course in surveying. Civ E 291 may be taken immediately prior to either the 2A, 3B or 4A terms.

Year 1A
Earth 121 Introductory Geology 1 (0.5)
Math 110A Calculus 1a (0.5)
Math 114 Algebra and vector geometry (0.5)
*Phys 011 Mechanics (0.5)
Chem 123 Chemical Reaction, Equilibria and Kinetics (0.75)
*Phys 011 may be replaced by Phys 121, 121L.

Year 1B
Earth 122 Introductory Geology 2 (0.5)
Math 110b Calculus 1b (0.5)
*Phys 112 & 112L Physics for the Life Sciences (0.75)
Chem 124 & 124L Organic Chemistry 1 (0.75)
CS 118 Computer Programming (0.5)
*Phys 112 & 112L should be replaced by Gen. E. 122 if timetabling permits.

Year 2A
Gen E 115 Engineering Concepts 1 (0.75)
Earth 231 Mineralogy (0.5)
Earth 235 Stratigraphy (0.5)
Civ E 203 Statics (0.5)
Civ F 221 Calculus (0.5)
(one-half credit arts elective) (0.5)

Year 2B
Civ E 205 Mechanics of Deformable Solids (0.5)
Civ E 222 Differential Equations (0.5)
Earth 281 Geochemistry 1 (0.5)
Earth 282 Petrography (0.5)
Earth 260 Introductory Structural Geology (0.5)
one-half credit Arts elective (0.5)
(recommended - a course in report writing)

Honours Physics
The Honours programme is in the form of a core of required courses, plus appropriate electives. The elective courses may be chosen from a wide range of courses offered by the Physics Department and by other departments of the University. 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). The choice of electives must be made to fit the student's timetable, and must be approved by the Chairman of the Department of Physics. The programme must include a total of twenty-four credits (including year one). It is recommended that students intending to take an Honours Physics programme should take six lecture-credits in first year. The required courses which constitute the core are listed below. Examples of possible elective programmes are available in the office of the undergraduate advisors. Detailed descriptions of the courses start in Chapter 15.
Elective Programmes

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 Bus. Administration, Computing, Electrical Engineering, etc. are kept on file in the office of the undergraduate advisor where you may obtain a copy on request. In choosing electives students should make sure that their programme contains a minimum of 24 credits. All such programmes are subject to timetable restrictions.

Co-operative Applied Physics (Honours)

Applied Physics is an Honours programme 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 programme Applied Physics students have the opportunity of exposure to practical research and development situations in Government and Industry. Work opportunities, which are available on a competitive basis, are co-ordinated to complement the student's course work and interest where possible. Many work term experiences, especially in the upper years, provide the student with a deeper insight into the meaning and methods of research as well as an incentive to develop course work. Such experience provides a contribution to the development of a scientist which cannot be earned 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 starting in Chapter 5. The normal progress of students in the Applied Physics programme is shown on p. 61.

The programme must include a total of twenty-four credits (including year one). It is recommended that students intending to take an honours physics programme should take six lecture-credits in first year.

Options

There are two main options in the Co-op Physics programme. 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. In choosing electives the students should ensure that their programme contains a minimum of 24 credits. 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 programme, and is detailed separately below.

A detailed description of the courses starts in Chapter 15.

Core programme for Honours Co-op Applied Physics

<table>
<thead>
<tr>
<th>Year 1</th>
<th>(For a complete discussion of Year 1, see page 223)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 2A Core (8 Stream)</td>
<td></td>
</tr>
<tr>
<td>Phys 10 Physics Seminar (0.0)</td>
<td></td>
</tr>
<tr>
<td>Phys 256 Wave Motion and Optics (0.5)</td>
<td></td>
</tr>
<tr>
<td>Phys 256L Physical Optics Lab (0.25)</td>
<td></td>
</tr>
<tr>
<td>Phys 254 Thermal Physics and Properties of Matter (0.5)</td>
<td></td>
</tr>
<tr>
<td>Math 213A* Advanced Calculus (0.5)</td>
<td></td>
</tr>
<tr>
<td>Math 216* Differential Equations (0.5)</td>
<td></td>
</tr>
</tbody>
</table>

| Year 2A Core (4 Stream) |                     |
| Phys 10 Physics Seminar (0.0) |                     |
| Phys 253 Electricity and Magnetism (0.5) |                     |
| Phys 253L Electricity and Magnetism Lab (0.25) |                     |
| Phys 255 Quantum Physics (0.5) |                     |
| Math 220A* Advanced Calculus (0.5) |                     |
| Math 215* Differential Equations (0.5) |                     |

| Year 2B Core (8 Stream) |                     |
| Phys 10 Physics Seminar (0.0) |                     |
| Phys 253 Electricity and Magnetism (0.5) |                     |
| Phys 253L Electricity and Magnetism Lab (0.25) |                     |
| Phys 255 Quantum Physics (0.5) |                     |
| Math 213B* Advanced Calculus (0.5) |                     |

| Year 2B Core (4 Stream) |                     |
| Phys 10 Physics Seminar (0.0) |                     |
| Phys 256 Wave Motion and Optics (0.5) |                     |
| Phys 256L Physical Optics Lab (0.25) |                     |
| Phys 254 Thermal Physics and Properties of Matter (0.5) |                     |
| Math 213b* Advanced Calculus (0.5) |                     |

*Note

Students may elect to take Math 230A and B and AM 260 in place of these courses.

Note

In order to satisfy core requirements, another 0.25 credit lab must be elected from Phys 270, 271, and 259L, in 2A or 2B.

| Year 2A Core |                     |
| Phys 10 Physics Seminar |                     |
| Phys 354 Atomic and Molecular Physics (0.5) |                     |
| Phys 358 Thermodynamics (0.5) |                     |
| Phys 360A Intermediate Laboratory (0.25) |                     |
| Phys 362 Classical Mechanics 1 (0.5) |                     |
| Phys 364 Mathematical Physics 1 (0.5) |                     |
| One of: Phys 371A, 371B, 353L (Laboratory) (0.25) |                     |

| Year 3A Core |                     |
| Phys 10 Physics Seminar |                     |
| Phys 354 Atomic and Molecular Physics (0.5) |                     |
| Phys 358 Thermodynamics (0.5) |                     |
| Phys 360A Intermediate Laboratory (0.25) |                     |
| Phys 362 Classical Mechanics 1 (0.5) |                     |
| Phys 364 Mathematical Physics 1 (0.5) |                     |
| One of: Phys 371A, 371B, 353L (Laboratory) (0.25) |                     |

| Year 2B Core |                     |
| Phys 10 Physics Seminar |                     |
| Phys 256 Wave Motion and Optics (0.5) |                     |
| Phys 256L Physical Optics Lab (0.25) |                     |
| Math 213A Advanced Calculus (0.5) |                     |
| Math 216 Differential Equations (0.5) |                     |
| Earth 231 Mineralogy and Crystallography (0.5) |                     |
| Earth 360 Applied Geophysics 1 (0.5) |                     |

Note

Students desiring Phys 444 must elect Phys 355 in third year.

| Year 4A-4B Core |                     |
| Phys 10 Physics Seminar |                     |
| Phys 434A Introductory Quantum Mechanics (0.5) |                     |
| Phys 441 Electromagnetic Theory (1.0) |                     |
| Phys 355 Nuclear and Practical Physics (if not taken in Year 3) (0.5) |                     |

Note

Phys 434B is strongly recommended for students intending to do graduate work, and Phys 443 is strongly recommended for students intending to do graduate work or intending to work as industrial physicists.

Honours Co-op Applied Physics: Geophysics Option

<table>
<thead>
<tr>
<th>Year 1</th>
<th>(for a complete discussion of Year 1, see page 223)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 2A Core (Fall)</td>
<td></td>
</tr>
<tr>
<td>Phys 10 Physics Seminar (0.0)</td>
<td></td>
</tr>
<tr>
<td>Phys 254 Thermal Physics and Properties of Matter (0.5)</td>
<td></td>
</tr>
<tr>
<td>Phys 256 Wave Motion and Optics (0.5)</td>
<td></td>
</tr>
<tr>
<td>Phys 256L Physical Optics Lab (0.25)</td>
<td></td>
</tr>
<tr>
<td>Math 213A Advanced Calculus (0.5)</td>
<td></td>
</tr>
<tr>
<td>Math 216 Differential Equations (0.5)</td>
<td></td>
</tr>
<tr>
<td>Earth 231 Mineralogy and Crystallography (0.5)</td>
<td></td>
</tr>
<tr>
<td>Earth 360 Applied Geophysics 1 (0.5)</td>
<td></td>
</tr>
</tbody>
</table>
Honours Psychology

The BSc Psychology programme 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.

A cumulative average of 75% must be maintained in the Psychology courses and a cumulative average of 60% in the Faculty of Science courses.

Year 1

is a normal Year 1 programme of the Faculty of Science (see page 222) with Mathematics 113, Physics 111-112 or 121-122 and 121L-122L, Biol 111-112, 111L-112L or two 200 level term courses, Chemistry 123-124 and 123L-124L, Psychology 101-102.

Year 2

Psych 201 Statistical Methods in Psychology (0.5)
Psych 202 Experimental Design (0.5)
One of Research (0.5)
Psych 293, 295, or 297.
Psych Electives* (1.5)
Science Electives** (2.0)
Unspecified Elective (1.0)

Year 3

Psych 301 Tests and Measurements (0.5)
One of Research (0.5)
Psych 393, 395, or 397
Psych Electives* (2.0)
Science Electives** (2.0)
Unspecified Elective (1.0)

Year 4

Psych 499 Senior Hönours Essay (1.0)
Psych Elective (1.0)
Science Electives** (1.0)
Unspecified Elective (2.0)

*This includes a 0.5 credit prerequisite to the specific research course selected
**No more than 2.0 credits offered under the "Science" label may be included in the total. Science elective credits.
The School of Optometry of the Faculty of Science offers a four year professional programme leading to the degree of Doctor of Optometry. It is the only School of Optometry in Canada offering a programme with English as the language of instruction. The immediate purpose of the programme 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 programme 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 programme, designed for persons with the O.D. degree who wish to improve and extend their clinical skills is available. Graduate programmes 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 landed immigrant status for at least twelve months prior to the registration day of the Fall term. Proof of landed immigrant status must accompany the application. Applications will not normally be accepted from foreign students on student visa.

Prerequisites
Applicants should satisfy the Admissions Committee that they are well-prepared academically for entry to the School of Optometry. A good background in Science and Mathematics is required and the disciplines of Biology/Zoology, Calculus, Chemistry, Physics and Psychology should be represented. At the University of Waterloo, the following programme or equivalent is recommended to students planning to apply to the first professional year: Biol 230, Cell Biology; Biol 211, Vertebrate Zoology; Biol 201, Human Anatomy, Histology, Embryology; Biol 240, Fundamentals of Microbiology; Chem 123, Chemical Reaction, Equilibria and Kinetics; Chem 124 and 266, Organic Chemistry; Chem 237, Biochemistry; Phys 121, 122, General Physics; Phys 246, Physical Optics; Psych 101, Introductory Psychology; Psych 201, Statistics; Math 113, Calculus. Laboratory courses must be completed where given with the above courses. To complete the pre-professional programme, additional courses in the behavioural sciences, social sciences and the humanities are recommended.

The Admissions Committee will also consider applications from superior students who have completed other academic programmes. 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 programme.

Selection Factors
All applicants should note that enrolment in the first professional year is limited to sixty and that in 1980 there were approximately three hundred and fifty applications for those places. Consequently, neither acceptance to nor successful completion of the preprofessional programme 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 programme at the University of Waterloo, but applicants to Year 1 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 1 regular Science as given at the University of Waterloo.

The provinces of Alberta, Manitoba and Saskatchewan have entered into an agreement with the School of Optometry regarding admission of applicants from those provinces. The agreement establishes that a maximum of seven applicants from Alberta, a maximum of three applicants from Saskatchewan and a maximum of three applicants from Manitoba may be admitted to the first professional year. Applicants from these three 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. Information on the residency qualifications for applicants from Alberta, Saskatchewan and Manitoba can be obtained by writing the Admissions Officer of the School of Optometry.

There is no age limit for applicants but only in exceptional circumstances will applicants older than thirty years be seriously considered for admission.
Application Procedures
Students enrolled at the University of Waterloo make application to the optometry programme by pre-registering for the first professional year during the spring preregistration in March. Graduates of the University of Waterloo or persons who were at one time registered at the University of Waterloo in any type of programme also apply by pre-registering in March. In the Winter term an interview with the admissions committee will be arranged for the student. Students who have completed the pre-professional programme 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 15, 1981. The completed OUAC form should reach the Centre in Guelph no later than February 1, if the copy is to reach the Registrar at Waterloo by the deadline of February 27. After the OUAC form has been processed by the Centre the applicant will receive a supplementary application package from the Registrar of the University of Waterloo. This will contain details on required transcripts, letter of reference and the curriculum vitae. 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 programme may apply for exemptions from these courses immediately after acceptance into the programme. Details on the policy of exemptions may be obtained by writing to the Admissions Officer 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 practice optometry in their country of origin may in certain instances be admitted to a more advanced level in a programme leading to the O.D. degree. For more information write: The Admissions Officer, 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 over age 30.
2) Applicants with undergraduate or graduate training who have not completed prerequisites for the pre-professional programme and who are considering a "make-up" year.
3) Applicants considering a "make-up" year to repeat courses for the purpose of raising grades.

4) Applicants who are presently engaged 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

Year 1: First Professional Year. First offered 1980-1981.

Fall Term
- Optom 100 History and Orientation (0.5)
- Optom 104 Anatomy of the Eye and Associated Structures (0.5)
- Optom 105 General Pathology (0.5)
- Optom 106 Geometric Optics (0.5)
- Biol 301 Vertebrate Physiology (first term) (0.5)

Winter Term
- Optom 111 Physiological Optics (0.5)
- Optom 114 Anatomy of the Eye and Associated Structures (0.5)
- Optom 115 General Pathology (0.5)
- Optom 116 Optometrical Optics (0.5)
- Biol 301 Vertebrate Physiology (second term) (0.5)


Fall Term
- Optom 241 Physiological Optics (0.5)
- Optom 242 Clinical Optometry (0.5)
- Optom 244 Neurophysiology of Vision (0.5)
- Optom 245 Ocular Pathology (0.5)
- Optom 246 Optometrical Optics
- Optom 261 Physiological Optics (0.5)

Winter Term
- Optom 251 Physiological Optics (0.5)
- Optom 252 Clinical Optometry (0.5)
- Optom 254 Physiology of Visual Systems (0.5)
- Optom 255 Ocular Pathology (0.5)
- Optom 259 Light and Illumination (0.5)
- Optom 274 Genetics (0.5)

Year 4: Third Professional Year. This programme will be revised after 1981-1982.

Fall Term
- Optom 401 Physiological Optics (0.5)
- Optom 402 Clinical Optometry (0.5)
- Optom 404 Neurophysiology of Vision (0.5)
- Optom 405 Ocular Pathology (0.5)
- Optom 406 Optometrical Optics (0.5)
- Optom 407 Optometrical Specialties: Contact Lenses (0.5)
- Optom 408 Optometry Clinic (0.5)
Winter Term
Optom 411 Physiological Optics (0.5)
Optom 412 Clinical Optometry (0.5)
Optom 414 Physiology of Visual Systems (0.5)
Optom 415 Ocular Pathology (0.5)
Optom 408 Optometry Clinic (0.5)
Optom 427 Optometric Specialities: Aniseikonia and Low Vision Aids (0.5)
Optom 428 Spring Clinic (1.0)

Note
Subject to the availability of programmes students in good standing are required to participate in vision care projects involving up to 400 hours during the period between their fourth and fifth years.

Year 5: Fourth Professional Year. This programme will be revised after 1982-1983.

Fall Term
Optom 500 Optometrical Jurisprudence and Praxis (0.5)
Optom 501 Physiological Optics (0.5)
Optom 502 Advanced Clinical Optometry (0.5)
Optom 504 Ocular Pharmacology (0.5)
Optom 508 Optometry Clinic (0.5)
Optom 509 Community Health Optometry (0.5)
Psych 357 Psychopathology (0.5)
Optom 538 Vision Care Project (0.0)

Winter Term
Optom 510 Optometrical Jurisprudence and Praxis (0.5)
Optom 511 Physiological Optics (0.5)
Optom 512 Advanced Clinical Optometry (0.5)
Optom 513 Optometric Communication (0.5)
Optom 514 Genetics for Optometrists (0.5)
Optom 518 Optometry Clinic (0.5)
Optom 519 Community Health Optometry (0.5)
Optom 599 (A-E) Comprehensive Examinations

Note
Students with a particular interest in and an aptitude for research in physiological optics may substitute Optom 501-511 for Psych 357 and Optom 513. A student is required to complete one or the other of these alternatives.

2. The Honours Science Programmes

The Honours Science programme allows a student to study sciences in greater depth than permitted in the General Science programme, but without as intense a degree of specialization as required in the more specialized programmes such as Honours Biology, Honours Chemistry, etc. Students desiring a somewhat broader background in the Sciences might find this programme more suitable than the more traditional specialized programmes. However, students contemplating graduate study in the traditional disciplines following their undergraduate studies are advised to pursue the more specialized Honours programmes.

Course programmes must be discussed with and approved by the appropriate Department Undergraduate Officer or his delegate.

A 60% cumulative overall average in all Faculty of Science courses is required in programme (1) outlined below; a 60% cumulative average in the field of specialization for all other programmes. This is the same as for all honours programmes in the Science Faculty.

All programmes require the successful completion of 22 or more credits, 20 of which must be lecture-credits, the number depending on the respective programme. At least 14 of the total credits must be Faculty of Science credits.

No more than 3 credits offered under the "Science" label may be applied to any programme.

One of the five programmes described below should be selected: Programme (1) is non-specialized; programmes (2), (3), (4) and (5) have a field of specialization: Biology, Chemistry, Earth Sciences or Physics respectively. All programmes lead to the degree of Bachelor of Science (Honours Science).

SPECIFIC REQUIREMENTS

Programme (1)
Honours Science (non-specialized)

Year 1
5 lecture credits, exclusive of laboratory credits. At least two of these must be Science courses chosen from: Biol 111-112 or two 200 level term courses; Chem 123-124 + labs; Earth 121-122; Phys 111-112 or Phys 121-122 + labs or Phys 162-163 + labs.

Years 2, 3 & 4
Normally 4 Science credits per year plus 2 other course-credits per year in Years 2 and 3; 1 other credit in Year 4. Of the total required 14 Faculty of Science credits, at least 10 must be at the 200-level or higher and at least 4 of them other than any Science labelled credits must be at the 300 or 400-level.
Programme (2)
Honours Science (with specialization in Biology)
(For Year 1, see page 222)

Year 2†
3 credits from Biology 210, 211, 220, 221, 230, 233, 239, 240, 241, 250.
Chemistry 266-266L and either 267 or 237-237L.
2 other credits (Stat 202 is recommended).

Year 3
1 other Science credit †
2 other credits.

Year 4
4 Science credits at least 2 of which are Biology credits from the 400-level or the list of 300-level courses above.
1 other credit.

† In order to graduate in Honours Science Programme 2 a student must take at least 1 term of biochemistry (Chem 237 & 237L, or 332 & 332L) and 1 term of organic chemistry beyond Year 1.

Students who plan to specialize in areas of Biology with a substantial Biochemical component should plan to take Biochemistry in Years 3 and 4. They are advised to take Organic Chemistry 267 in their second year and to select, as electives, Biochemistry 332-333, 332L, 333L in their third year and other Biochemistry courses in fourth year. Other students are advised to take Chem 237-237L in their second year. Students in this latter 'stream' who subsequently wish more Biochemistry should be prepared to take Organic Chem 267 as an elective before taking Chem 333.

Programme (3)
Honours Science (with specialization in Chemistry)
Year 1
Five lecture credits plus related lab credits. Chem 123-124 and 123L-124L, Phys 111-112 or 121-122 and Phys 111L-112L or 121L-122L, Math 113 must be included.

Year 2†
3 Chemistry lecture credits, at least 2 of which must be chosen from Chemistry 212, 220, 221, 254, 255, 264, 265.
1 lecture credit to be chosen from Physics, Biology or Earth Sciences. (Not Science-labelled courses)
Elective credits to give a total of at least 6 credits in the Year.
Chem 10, Chemistry Seminar (0.0) is also required.

Programme (4)
Honours Science (with specialization in Earth Sciences)
In total, at least 23.0 credits of which 10 are Earth Sciences credits, selected as indicated below. In addition at least four other Science credits and eight other course-credits must be chosen. Science-labelled courses may not be used for Science course-credits. (Chem 123-124 and 123L-124L, a Year 1 Physics course, Math 113, CS 118 or equivalent must be among these choices). A suggested year by year breakdown is as follows:

(For Year 1, see page 222)

Year 2
Earth 221, 231, 232, 235, 236, 260
1 other Science credit
2 other credits

Year 3
3 or 4 Earth credits at the 300-level (chosen from Earth 331, 332, 333, 336, 342, 345, 346, 360, 370)
At least 1 other Science credit
At least 1 other credit (for a total of 6 credits in Year 3)
Attendance on field trips (Earth 390, Earth 490) is required.

Year 4
4 Science credits of which at least 2 are Earth Sciences credits at the 300-level shown above or from the 400-level.
1 other credit.

† Before graduation a student must obtain at least 0.5 lab credit and one 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.
Programme (5)
Honours Science (with specialization in Physics)
This programme was designed to allow a student the broadest possible selection of courses consistent with specialization in Physics. A total of 22 credits are required, 14.0 of which must be Faculty of Science credits.

The following Honours Courses from Physics and Mathematics should be included.

(For Year 1, see page 222)

Year 2
Physics 253, 253L, 254, 256, 256L, 255 (or 324, 325 in third year), Math 213a-213b, 216.

Years 3 and 4
At least 2.5 credits of Honours Physics core courses at the 300 or 400 level and an additional 3.5 credits of Physics courses at the 300 or 400 level.

In addition at least 1.5 credits of Physics lab courses must be completed during the four years of the programme.

3. General Science Programmes

The General Science Programme is available as a three- or four-year option. Students may specialize in a particular subject area in the three-year programme or may elect to pursue a broad range of Science subjects (especially a "non-major" programme). The three-year programme is titled "General Science" with no area of specialization designated. The four-year programme is the official majoring General Science programme. It is only available with a selected major field (Biology, Chemistry, Earth Sciences, Physics, or as a General Science and Business programme in which a broad range of specified Science courses is required, rather than a majoring area). It is officially titled "General Science, Biology Major", "General Science, Chemistry Major", etc.

Graduates of the three-year programme who have taken the required courses are qualified to apply for admission to medical school in Ontario. Students who have passed the first year of the programme with appropriate choice of courses are qualified to apply for admission to a dental school.

Graduates of the four-year programme who have taken appropriate courses will be eligible for certain categories of industrial and government employment for which the three-year programme will not fit them; likewise they can meet the subject requirements for application to courses at a College of Education in Ontario with specialization in a single subject.

Depending on the option chosen, a student may graduate with the General BSc after either three or four years; the graduation diploma will indicate whether the three- or four-year programme has been completed. A student who has graduated from the three-year programme may apply to register for the four-year programme; upon successful completion of the latter, a new graduation diploma will be issued in exchange for the original. Students may transfer from one of these options to the other; for transfer from the three- or the four-year programme, the student must have the necessary course selection and standing required for a major field.

General Science - Three-year Programme

The three-year programme BSc requires the successful completion of 15 credits at least 14 of which must be lecture credits. At least half of the 15 credits must be in Science and at least 2 of these must be lecture credits from the Year 1 offerings in two different disciplines. Normally no more than 7 are allowed from the same subject area (i.e. no more than 7 Biology credits or 7 Mathematics credits or 7 English credits, etc.). At least 8 of the 15 credits must be at the 200-level or higher. Normal progress is 5 lecture credits per year.

If students wish to specialize in a particular subject area in Science they are advised to follow the recommendations of Year 1-3 of the four-year programme. Alternatively, a broader selection of science subjects may be chosen but students should be warned not to make their course selection so broad and varied as to find their background of little use following graduation. The responsibility of arranging a programme selection over the three years ultimately rests with the student and they should ensure it meets their needs. To ensure that proper advice is available and given regarding course selection, the student's programme must be approved at pre-registration time each year by a Faculty advisor.

Students are encouraged to take at least 4 courses (an average of better than one per year) from non-Science areas such as Arts or Mathematics.

The minimum standard for graduation from the three-year programme will be a cumulative (overall average of 55% calculated for all courses taken in any year - whether passed or failed).

Recommended Programme

Year 1
5 lecture credits, exclusive of laboratory credits. At least two of these must be Science courses chosen from: Biol 111-112 or two 200-level term courses; Chem 123-124 + labs; Earth 121-122; Phys 111-112 or Phys 121-122 + labs or Phys 162-163 + labs.

A Math course is strongly recommended.
Year 2
5 credits of which 2 or 3 should normally be in Science.

Year 3
5 credits of which 2 or 3 should normally be in Science.

The following list, while not complete, indicates some of the courses from which a choice should be made. Since some Departments offer Honours or General equivalents of the same course area, or co-operative or regular versions of the same course area, duplication of subject matter is not allowed. It is usually obvious from the course descriptions where such duplication is possible and care should be taken to avoid it as credit for only one such overlapping course will be allowed (e.g. credit for one of Chemistry 220-221, 226-227; one of Physics 111-112; 121-122, 162-163; etc.). In addition, where Departmental course listings clearly indicate an elective is available only to Arts students, or Engineering students, or Human Kinetics and Leisure Studies students, etc.; such courses may not be selected in the General Science programme. Students must also have any necessary prerequisites listed before attempting upper year courses: these are listed in the Departmental descriptions.

Science courses recommended
(other than Year 1 courses)


(No more than 3 credits may be selected from the courses under the "Science" label).


Mathematics courses recommended
Mathematics 113, 111a, 111b, 215, or 216, CS 118, 180, 210; AM 101, 111. Stat 204, 205.

Arts courses recommended
It is impossible to list all options here since tastes vary. Many students select first or second year options from the following subject areas:
Anthropology, Arts, Classical Studies, Economics, English, French, Geography, German, History, Philosophy, Political Science, Psychology, Russian, Sociology, Religious Studies. Subject to prerequisites and timetable, a wide range of Arts courses is available.

General Science - Four-year Major Programmes
The four-year programmes require the successful completion of at least 20.0 or more credits for the BSc, the number depending on the respective programme. Of this total at least 18.0 must be lecture credits. At least half of the 20.0 credits presented must be in Science. Students are encouraged to take at least 4 courses (an average of one per year) from non-Science areas such as Arts or Mathematics. No more than 3 credits may be selected under the "Science" label. An official major field (from Biology, Chemistry, Earth Sciences and Physics) must be selected; the credits from this major field must be completed as specified and normally not more than 10 from the major field area will be allowed.

The only exception to the requirement of a major field is in the General Science and Business programme where a selection of both Business and Science courses are required.

While considerable flexibility to take electives exists in this programme, students must take the courses required by their major Departments (there are at least 8 free credits available in each programme; Departments may have published recommendations regarding electives which should be strongly considered although they are not compulsory).

The minimum standard for graduation from the four-year majoring programmes will be a cumulative (overall) average of 55% calculated from all courses taken (in any year - whether passed or failed) plus a 60% cumulative average for the major field courses. Students who do not maintain their major field average in the four-year programme will be transferred to the three-year ("non-major") programme where a major field average is unnecessary.

Recommended Programme
The selection of courses in upper years will be restricted partly by limitations imposed by the timetable, and partly by the necessity in many courses of having completed prerequisites. Each student's programme must, therefore, be approved by the Undergraduate Officer of the Department of his major field.
The following programmes are those recommended by the department of major study in their fields. The University will make every effort to ensure that the timetable accommodates these programmes.

**Biology Major**

**Year 1**
Including two 200-level term courses in Biology (see Note 6 on pg. 000) and Chem 123-124 and 123L-124L (see p. 223).

**Year 2†**
Three credits from Biology 210, 211, 220, 221, 230, 233, 239, 240, 241, 250
Chem 266-266L and either 267 or 237-237L
Two other credits

**Year 3**
Three or two non-Biology credits.†

**Year 4**
Five credits at least two† of which are 400-level Biology courses or from the above list of 300-level Biology courses.

†In order to graduate in the Biology Major programme a student must take at least 1 term of biochemistry (Chem 237 & 237L, or 332 & 332L) and 1 term of organic chemistry beyond Year 1.

Students who plan to specialize in areas of Biology with a substantial Biochemical component should plan to take Biochemistry in Years 3 and 4. They are advised to take Organic Chemistry 267 in their second year and to select, as electives, Biochemistry 332-333, 332L, 333L in their third year and other Biochemistry courses in fourth year. Other students are advised to take Chem 237-237L in their second year. Students in this 'stream' who subsequently wish more Biochemistry should be prepared to take Organic Chem 267 as an elective, before taking Chem 333.

††Students wishing to apply for the Ontario Department of Education Honour Specialist Qualification must choose three credits in Biology in Year 3 or take a third Biology credit as an extra course. In Year 4, three Biology credits should be selected.

**Note**
Some possible electives are shown in the list under the three-year programme. These courses would be suitable choices here. (Physics 301-302 is especially recommended.)

---

**Chemistry Major**

**Year 1**
Including Chem 123-124 and 123L-124L and Math 113 and a full-year Physics course.

**Year 2†**
Chem 226-227 and 226L-227L, 266-267, 266L, 218, 219
2 Elective credits†

**Year 3††**
Chem 316-316L, 356-357, 356L-357L, 366-366L
2 Elective credits†

**Year 4††**
Five elective credits to complete the requirements for the degree.

†Electives can be freely chosen provided that before graduation at least two Chemistry credits are obtained at the 300- or 400-level, in addition to the required courses listed above. At least 19.0 lecture-credits must be obtained before graduation.

††All students in Chemistry programmes must also register in Chem 10 in each term of their programme beyond Year 1.

**Earth Science Major**

**Year 1**
Including Earth 121-122 and Chem 123-124 and 123-124
Land at least 1.5 credits from courses discussed in Note 4 (see page 222)

**Year 2**
Earth 221, 231, 232, 235, 236, 260
Two elective credits

**Note**
Students should note that Phys 111-112 is a prerequisite for the Applied Geophysics course Earth 360 given in the third year. Math 113 and an introductory course in computer programming are prerequisites for Earth 355, 356 and 461 given in the third and fourth years.

**Year 3**
Two or three credits from:
Earth 331, 332, 333, 336, 342, 345, 360, 370
Two or one course-credits from Science or Mathematics
Arts elective: One credit. Attendance on field trips (Earth 390, Earth 490) is required.
Year 4
Two or three credits from:
Earth 421, 427, 432, 433, 434, 435, 438, 439, 440, 456, 461, 470
Three or two credits from non-Earth Sciences courses

Physics Major (a minimum of 20.0 credits required)

Year 1
(Including Phys 121-122 or 162-163 and their labs and Math 113 (see page 222)

Year 2
Phys 222-223 and 222L-223L, 226-227 and 226L-227L
One of: Math 216, 220a,b or a course in computing
One of: Chem 218-219, 266-267, Sci 251-252, Earth 121-122 or 231-232
Elective

Year 3
Phys 324-325
One or two of: Phys 250-251, 352 and 352L, 353 and 353L, 358-359, 368-369, 380-381; or 364-365
Two or one of: Math 224a,b or Stat 204-205:
Chem 218-219 or 356-357
Arts or Mathematics Elective

Year 4
Two or three of: Phys 250-251, 352 and 352L, 353 and 353L, 358-359, 362-363, 364-365, 368-369, 480-481, 441
Two or one non-Physics Science credits
Arts or Mathematics Elective

General Science and Business
There is a growing need for graduates who have competence in the combined disciplines of science and business administration. For those students whose leanings are towards administration in industry, marketing, analysis, etc., the following programme is recommended. The business and economic courses normally provide the prerequisite background for a Master of Business Administration course. Normally a B average is required in these courses. Admission requirements for postgraduate studies in Business Administration depend on the admitting university. In some instances, an entrance examination may be required. It is the student's responsibility to obtain information regarding admission from the university of their choice.

The programme is made up of at least 21 credits with 10 required in Science (including at least 4 at the 300-level or higher) and the remainder in Mathematics, Economics and Business Administration. The Business courses are given at Wilfrid Laurier University and may be taken by University of Waterloo students through co-operation between the two Universities; Economics courses are offered by the Department of Economics, University of Waterloo. Because courses for this option are given by several faculties at two universities, timetable changes may occur from time to time. It is the student’s responsibility to keep informed of these changes.

A 55% overall average must be maintained in this programme. A 70% average is normally required in the Economics and Business courses for transfer credit to Schools of Business Administration.

Year 1
5 lecture credits:
At least 2.0 lecture credits must be from Biol 111-112 + labs or any two term courses from the 200-level, Chem 123-124 + labs, Earth 121-122 and Phys 111-112 or 121-122 + labs.

plus
Math 113
Econ 101-102
CS 118 and CS 115

Year 2. 3 and 4
Students must take during years 2 through 4, at least 5 lecture-credits from one of the departments of Science, viz. Biology, Chemistry, Earth Sciences or Physics and at least 2 of these credits must be at the 300 level or higher. Enough Science credits must be taken to give a total of 10 lecture credits.

plus at Year 2
Econ 191-192
Econ 201-202

plus at Year 3
Stats 204-205
Econ 391-392 M Sci 44
MSci 46

plus at Year 4
3 credits from:
Econ 393-394; Bus 385-395 (WLU); Bus 352-362 (WLU)
Bus 454-464 (WLU)

Note:
Students interested in Science with Business may also wish to consider a joint honours programme between Science and Management Studies, or an honours programme in Science with a Management Studies minor. See the course description section of the calendar, Chapter 15 under Management Studies.
Course Description Information

Explanatory Notes and Terminology
Each course description begins with a line of coding as shown in the sample below. The course numbers are prefixed by a subject code. 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.

The course descriptions follow the format of the Timetable Enrolment Report and the Course Offerings List, two documents students use when preregistering. However students should keep in mind that the calendar is not a pre-registration document. Information in the calendar is subject to change; students should consult the Course Offerings List and the Timetable Enrolment Report when pre-registering.

Sample Course Description

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Term(s) Offered</th>
<th>Type of instruction and Number of hours/wk</th>
<th>Credit weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stat 444</td>
<td>S</td>
<td>2C, 1S</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Course Name—Statistical Methods with Socio-Economic Applications 1


Extra information about course requirements
Prereq: Stat 331 or 351.

Terminology

Terms Offered
F  Fall term
S  spring term
W  winter term
J  summer, first half, July
A  summer, second half, August
M  summer, both terms, July, August
Y  September – April—8 month session

Type of Instruction
C  Lecture
L  Laboratory
T  Tutorial
S  Seminar
D  discussion
R  reading course
wkshp  workshop
std  studio
fldlab  field lab
prereq  prerequisite
coreq  corequisite
P  Practicum
## Subject Codes

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Course Code</th>
<th>Course Name</th>
<th>Subject Code</th>
<th>Course Code</th>
<th>Course Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACTSC</td>
<td>Actuarial Science</td>
<td>Ital</td>
<td>AM</td>
<td>Applied Math</td>
<td>Italian</td>
</tr>
<tr>
<td>Anth</td>
<td>Anthropology</td>
<td>Kin</td>
<td>Arch</td>
<td>Architecture</td>
<td>Kinesiology</td>
</tr>
<tr>
<td>Arts</td>
<td>Arts</td>
<td>Lat</td>
<td>Biol</td>
<td>Biology</td>
<td>Latin</td>
</tr>
<tr>
<td>Bus</td>
<td>Business</td>
<td>M Env</td>
<td>CDN St</td>
<td>Canadian Studies</td>
<td>Man-Environment Studies</td>
</tr>
<tr>
<td>Ch E</td>
<td>Chemical Engineering</td>
<td>M Sci</td>
<td>C Civ</td>
<td>Classical Civilization</td>
<td>Management Sciences</td>
</tr>
<tr>
<td>Chem</td>
<td>Chemistry</td>
<td>MGTST</td>
<td>C &amp; O</td>
<td>Combinatorics &amp; Optimization</td>
<td>Management Studies</td>
</tr>
<tr>
<td>Civ E</td>
<td>Civil Engineering</td>
<td>Math</td>
<td>CS</td>
<td>Computer Science</td>
<td>Mathematics</td>
</tr>
<tr>
<td>C &amp; O</td>
<td>C &amp; O</td>
<td>MTHEL</td>
<td>CS</td>
<td>Computer Science</td>
<td>Mathematics</td>
</tr>
<tr>
<td>Dance</td>
<td>Dance</td>
<td>MIE</td>
<td>Dance</td>
<td>Dance</td>
<td>Music</td>
</tr>
<tr>
<td>Drama</td>
<td>Drama</td>
<td>Music</td>
<td>Dutch</td>
<td>Dutch</td>
<td>Optometry</td>
</tr>
<tr>
<td>Econ</td>
<td>Economics</td>
<td>Optom</td>
<td>Earth</td>
<td>Earth Sciences</td>
<td>Peace and Conflict Studies</td>
</tr>
<tr>
<td>El E</td>
<td>Electrical Engineering</td>
<td>Phil</td>
<td>Econ</td>
<td>Economics</td>
<td>Philosophy</td>
</tr>
<tr>
<td>Engl</td>
<td>English</td>
<td>Phys</td>
<td>Eng</td>
<td>Engineering</td>
<td>Physics</td>
</tr>
<tr>
<td>Env S</td>
<td>Environmental Studies</td>
<td>Plan</td>
<td>Eng</td>
<td>Engineering</td>
<td>Planning</td>
</tr>
<tr>
<td>Fine</td>
<td>Fine Arts</td>
<td>Plan</td>
<td>Fr</td>
<td>French</td>
<td>Pure Math</td>
</tr>
<tr>
<td>Fr</td>
<td>French</td>
<td>Plan</td>
<td>Gen E</td>
<td>General Engineering</td>
<td>Polish</td>
</tr>
<tr>
<td>Geoq</td>
<td>Geography</td>
<td>Plan</td>
<td>Ger</td>
<td>German</td>
<td>Political Science</td>
</tr>
<tr>
<td>Ger</td>
<td>German</td>
<td>Plan</td>
<td>Grk</td>
<td>Greek</td>
<td>Psychology</td>
</tr>
<tr>
<td>Grk</td>
<td>Greek</td>
<td>Plan</td>
<td>Helth</td>
<td>Health Studies</td>
<td>Religious Studies</td>
</tr>
<tr>
<td>Hist</td>
<td>History</td>
<td>Plan</td>
<td>Helth</td>
<td>Health Studies</td>
<td>Social Work</td>
</tr>
<tr>
<td>ISS</td>
<td>Interdisciplinary Social Science</td>
<td>Stat</td>
<td>Helth</td>
<td>Health Studies</td>
<td>Sociology</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Hist</td>
<td>History</td>
<td>Statistics</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ISS</td>
<td>Interdisciplinary Social Science</td>
<td>Studies in Personality &amp; Religion</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Department of Anthropology

Associate Professor, Chairman of the Department
T. S. Abler, BA (Northwestern), MS (Wisconsin-Milwaukee), PhD (Toronto)

Associate Professors
D. E. Counts, BS (S. W. Texas State College), MA (Kentucky), PhD (Southern Illinois) (on Sabbatical Leave 1981-82)
Wm. B. Roosa, BA (Texas Christian), MA (New Mexico), PhD (Michigan)
M. Shimp (International Christian, Japan) MA, PhD (Br. Col.)
S. M. Weaver (International Christian, Japan) MA, PhD (Toronto)

Assistant Professor
M. H. Hill, BA (Washington), MA (Washington State), PhD (Southern Illinois)
E. A. Roth, BA (Missouri-Columbia), MA (Toronto), PhD (Toronto)

Faculty members holding cross and/or joint appointments as shown
*Sociology and Anthropology (St. Jerome's)
*Anthropology and Urban Regional Planning

Course Descriptions

Anthropology 101 S,F,W 3C 0.5
Human and Cultural Evolution
An overview of Physical Anthropology and Archaeology. Lectures on living and fossil primates, the fossil evidence for the origins and development of man, modern races, and archaeological evidence for the origins and development of culture. Offered by correspondence winter term.

Anthropology 102A F,W 3C 0.5
Introduction to Social and Cultural Anthropology
The dynamic nature of socio-cultural systems is examined. Topics include language, technology, social organization, economics, politics, and religion. Data are drawn from a broad ethnographic base, including both "primitive" cultures and modern, developed societies. Offered by correspondence fall term.

Anthropology 102B Anthropology Through Science Fiction
Not offered 1981-82

Anthropology 103 W 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.

Anthropology 202 Principles of Social Organization
Not offered 1981-82

Anthropology 203 F 3C 0.5
Prehistoric Man in North America
This is a general introduction to North American Archaeology. The traditional cultural ecological approach is compared and contrasted with the more revolutionary ideas recently expounded by popular writers.

Anthropology 204 Language Learning
Not offered 1981-82.

Anthropology 205 Anthropology of Race and Racism in Canada
Not offered 1981-82.

Anthropology 220 Prehistoric Archaeology: Old World I
Not offered 1981-82.

Anthropology 221 W 3C 0.5
Prehistoric Archaeology: Old World II
Examination of the transition to an economy based on food production, the spread of food producing economies, the rise of civilization. Areas and periods of emphasis will vary from year to year. Not acceptable for Honours Anthropology credit.
Anth 223  S  3C  0.5  
Archaeology of Peru and Meso-America  
Problems in cultural dynamics will be considered as  
exemplified in the rise and effects of the civilizations  
of Meso and South America. Areas and periods of  
emphasis will vary from year to year.  
Offered Spring 1981.

Anth 228  F  3C  0.5  
People of the Pacific  
A comparative ethnological survey of selected  
imigenous societies in the Pacific Region.

Anth 230  F  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.  
Offered by correspondence winter term.  
Prereq: Second year standing

Anth 233  W  3C  0.5  
Eskimo Cultures  
Eskimo cultures of Alaska, Canada, and Greenland  
from the time of European and Asian contact to the  
present. Administrative systems imposed on the  
Eskimo will be analyzed and compared, as will the  
contemporary problems these communities face  
today.  
Prereq: Second year standing

Anth 236J  Social and Cultural Change in South East  
Asia  
Not offered 1981-82

Anth 241  The Contemporary Canadian Indian Scene  
Not offered 1981-82

Anth 246J  W  3C  0.5  
Social and Cultural Change in Modern Japan  
This course analyzes the traditional social structure  
as well as changes in social, economic and cultural  
spheres in Japan since 1868. Current topics such as  
land reform, the consequent changes, and changing  
values in Japanese society will be analyzed.  
Offered at St. Jerome's College.

Anth 250  Regional Studies in Archaeology  
Not offered 1981-82

Anth 258  F  3C  0.5  
Anthropology and the Future of Man  
Anthropological theories pertaining to culture  
change and cultural evolution are examined in the  
context of the modern world. Long and short term  
trends in technology are examined using data from  
Archaeology, Ethnography, History, Technology and  
Science.  
Prereq: Anth 101 or 102 or permission of the  
instructor

Anth 260  F  3C, 1L  0.5  
Human Evolution  
Data, methods, and theory in the study of the origin  
and evolution of humans are surveyed. Topics will  
include osteology, growth and development, the  
fossil record, and genetics.  
Prereq: Anth 101 or permission of the instructor.

Anth 261  Primate Behaviour  
Not offered 1981-82

Anth 270  W  3C, 1L  0.5  
Archaeological Method and Technique  
A survey of the technique used by archaeologists in  
collecting and analyzing information. Attention to  
the contributions of other disciplines.

Anth 271  Archaeological Field Methods  
Not offered 1981-82

Anth 275  W  3C  0.5  
Principles of Archaeology  
An introduction to the working assumptions, analytic  
approaches, and integrative and descriptive methods  
of archaeological anthropology.  
Recommended to Honours Anthropology students

Anth 283  Phonology for Non-Linguists  
Not offered 1981-82

Anth 285  Descriptive Grammar 1 - Morphology  
Not offered 1981-82

Anth 286  Descriptive Grammar 2 - Syntax  
Not offered 1981-82

Anth 290  W  3C  0.5  
Language and Culture  
An examination of language as it reflects the culture  
of the speakers. Focus will be on exploring aspects  
of vocabulary and special usages for their cultural  
relevance, with illustrations from a variety of  
languages.  
Prereq: One half-course from each of linguistics and  
socio-cultural anthropology

Anth 311  Magic, Witchcraft and Religion  
Not offered 1981-82
Anth 320 Pleistocene Prehistory in the Old World
Not offered 1981-82

Anth 321 W 3C 0.5
Pleistocene Prehistory in the Old World
Detailed considerations of prehistoric cultural developments from earliest toolmaking to the transition to agriculture. An examination of the human mode of adaptation and the increasing complexity of cultural systems among prehistoric hunters and gatherers. Areas and periods of emphasis will vary from year to year.
Prereq: Anth 275 or permission of the instructor

Anth 322 W 3C 0.5
Prehistoric Man in the Great Lakes Area
An in-depth study of the archaeological evidence of prehistoric man in the Great Lakes area from his arrival ca. 11,000 years ago to the coming of Europeans. Cultural ecology and cultural evolution will be stressed.
Prereq: Anth 203 or consent of the instructor

Anth 330 Cultural Ecology
Not offered 1981-82

Anth 333 F 3C 0.5
Canadian Communities and Planned Change
The nature of planned programmes and their implications for the communities involved through ethnological studies of small communities in Canada and abroad. Reasons for the success or failure of programmes of change are sought in relation to community structure.

Anth 334 F 3C 0.5
Ethnicity and Ethnic Diversity in Canada
Various approaches to the phenomenon of ethnicity will be examined and illustrated from a social anthropological perspective. Special emphasis will be placed on the ethnography of ethnicity/ethnicities and on vertical and horizontal differentiation in Canada.

Anth 345 Special Problems in Anthropology
Not offered 1981-82

Anth 346 Special Problems in Anthropology
Not offered 1981-82

Anth 349 F 3C 0.5
Special Problems Topic: Hunting and Gathering Societies
The goal of this course will be cross-cultural comparisons and analysis of the last remaining hunting-gathering groups of the World from social, biological, and archaeological viewpoints.

Anth 350 Sex Roles in Anthropology
Not offered 1981-82

Anth 365 W 3C 0.5
Fossil Man
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 370 Ethnographic Field Methods
Not offered 1981-82

Anth 372 Archaeological Techniques
Not offered 1981-82

Anth 373 Archaeological Reporting
Not offered 1981-82

Anth 377 W 3C 0.5
Early Man 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, 222, or 322, or permission of the instructor

Anth 386 Applied Anthropology
Not offered 1981-82

Anth 390 Y 1.0
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 S,F,W 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 401 Seminar in the Literature of Social and Cultural Anthropology
Not offered 1981-82

Anth 420 Social and Cultural Change
Not offered 1981-82
Anth 449 Honours Seminar
Not offered 1981-82

Anth 451 The Formative Years of Cultural Theory
Not offered 1981-82

Anth 452 W 3S 0.5
Contemporary Cultural Theory
A survey of cultural theory from post World War II to the present.
Prereq: Anth 101, 102

Anth 492 Y 1.0
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 495/497 S,F,W 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 499 Y 1.0
Honours Essay
Directed reading and research in a selected area of anthropology inquiry.
Open only to Honours Anthropology students.

Course Descriptions
Anthropology

School of Architecture

Professor, Director
R. H. Sims, AADip (Hon), (London) RIBA

Associate Professor, Associate Director,
Undergraduate Officer
A. Banerji, BArch, (Calcutta), MArch (North Dakota State)

Professors
L. A. Cummings, AB (Washington), AM (Missourri), PhD (Washington) (on Sabbatical Leave, Spring Term, 1981)
C. K. Knapper, BA Hons (Sheffield) PhD (Saskatchewan) (on Sabbatical Leave 1981-82)
P. H. Nash, BA, MA (UCLA) CE (Grenoble)
MCP, MPA, PhD (Harvard), MCIP
F. H. Watts, AA Dip (London), MLA (Harvard), RIBA, MRAIC

Associate Professors
B. Culjat, BArch (Toronto), PhD (Royal Inst. Technology, Stockholm)
M. Elmitt, National Diploma in Design (High Wycombe)
B. R. Hunt, AADip (London), RIBA, MRAIC
D. B. McIntyre, BArch (Toronto), MRAIC
R. M. Schuster, BS, MS (North Dakota State), PhD (Iowa State), PEng
J. C. Somfay, BArch (N.S.W. Sydney), MArch (Toronto), MRAIC
F. Thompson, BArch, MArch (Toronto), MRAIC

Assistant Professors
O. Dutt, BA (Punjab), BSc (Hon) (London), MS (Wisconsin), PhD (Waterloo), PEng (on Sabbatical Leave, Winter Term, 1981)
E. R. Haldenby, BES, BArch (Waterloo)
R. Wiljer, BA (Waterloo), MA (Ottawa)

Lecturer
D. McKay, BArch (Toronto)

Adjunct Professor
G. Banz, MSc (Oklahoma State), Arch.Dip. (Zurich)
P. J. Stokes, BArch, LLD (Toronto), FRAIC
J. Zvina

Adjunct Assistant Professor
E. Gustavs, BArch, MArch (Toronto), MRAIC

Adjunct Lecturers
S. Arnold, BA (Southern Illinois)
G. C. Consiglio, BArch (Toronto), MRAIC
F. Final, AA Dip (London)
Course Descriptions

Arch 163  W  1C,2L  0.5
Statics
Basic concepts, forces, moments, systems of forces, resolution of forces, transformation of couples; resultant of force systems; centre of gravity of a system of forces and of composite bodies; equilibrium, free body diagrams; shears, moments, bar forces in simple trusses; friction, moment of inertia.
Prereq: Arch 175 or Math 130

Arch 212  F  2C,2L  0.5
Computer Science Simulation
Simulation programming is developed in FORTRAN so as to build up meaningful architectural simulation concepts necessary in architectural planning. Specific simulation languages such as G.P.S.S. is introduced.
Prereq: none

Arch 213  S  4C  0.5
Computer Generated Design 1
Architectural Design 1
An overview of design logic and computer system requirement currently used for architectural design.
Prereq: CS 116 or consent of instructor

Arch 262  F  2C,2L  0.5
Strength of Materials
Concept of simple stress and strain; statically determinate 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 263  S  2C,2L  0.5
Theory of Structures 1
Historic review of building structures, live and dead loading, wind, snow, earthquake, reactions, stability, and indeterminacy of structural systems; shears, moments and qualitative deflected shapes; bar forces in pin-connected frameworks; approximate methods of analysis for high rise building frames; deflection calculations by the moment area method, influence lines, introduction to arches and cables.
Prereq: Arch 262
Course Descriptions
Architecture

Arch 265  S  1C,2L  0.5
Structural Morphogenesis
Prereq: Architecture students should have completed first year; other students require consent of instructor.

Env S 271
Introduction to Quantitative Research Methods
See Env S course descriptions, page 323.

Env S 272
Computer Programming in Environmental Studies
See Env S course descriptions, page 323.

Arch 283  W  3C/fieldtrip  0.5
Preservation Practice-Technology and Technique
An introduction to the field of preservation of older buildings, particularly in Canada; dealing mainly with older building technology, typical problems in the preservation field and indicated steps toward solution.

Arch 313  F,W  4C  0.5
Computer Generated Design 2
Architectural Design 2
Input from various other courses is formulated into comprehensive data structures and simulated behaviour patterns; methods of synthesis problemsolving techniques, analysis of thought processes and protocol analyses. Course is project oriented.
Prereq: Arch 213

Arch 363  F  2C,2L  0.5
Theory of Structures 2
Advantages, limitations and principles of indeterminate structures; analysis of continuous beams and rigid frames by consistent deformations, moment distribution, slope deflection methods.
Prereq: Arch 263

Arch 372  W  2C,2L  0.5
Mechanical Systems 1
Plumbing and drainage; heating, ventilating and air-conditioning systems; electrical distribution for power and light; illumination; acoustics, geometrics and materials; vertical transportation systems.
Prereq: Arch 293, or consent of instructor

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.

Env S 111 Introduction to the Study of the Future
See Env S course descriptions, page 323.

Env S 195A Introduction to Environmental Studies
See Env S course descriptions, page 323.

Env S 195B Introduction to Environmental Problems
See Env S course descriptions, page 323.

Env S 200 Field Ecology
See Env S course descriptions, page 323.

Env S 201 Introduction to Environmental and Planning Law
See Env S course descriptions, page 323.

Env S 202 Social Science Approaches to Environmental Problems
See Env S course descriptions, page 323.

Arch 223  S  2C  0.5
Human Ecology
Social Behaviour as the Human/Physical Interface
The biological and psychological basis of perception and cognition of environments; factors affecting percepts, images and meanings, small groups and the social environment; the structure, functioning and change of neighbourhoods and communities.
Prereq: Env St 195A

Arch 224  F,S  1C,3std  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 or 193 or consent of instructor

Env S 252 Media Tools for Environmental Studies
See Env S course descriptions, page 323.

Env S 253 Medial Tools for Environmental Studies - Advanced Level
See Env S course descriptions, page 323.

Env S 310 Behavioural Studies
See Env S course descriptions, page 323.

Env S 333 Parkland Management
See Env S course descriptions, page 323.
Course Descriptions

Architecture

Env S 358 Environmental Pollution and Its Control
See Env S course descriptions, page 323.

Env S 380/381 Environmental Studies Workshop
See Env S course descriptions, page 323.

Env S 400 Professional Development in Environmental Management
See Env S course descriptions, page 323.

Env S 401 Environmental Law
See Env S course descriptions, page 323.

Env S 402 Planning Law
See Env S course descriptions, page 323.

Env S 411 Alternative Future Environments 1
See Env S course descriptions, page 323.

Env S 412 Alternative Future Environments 2
See Env S course descriptions, page 323.

Env S 417 Land Use History and Landscape Change 1
See Env S course descriptions, page 323.

Env S 418 Land Use History and Landscape Change 2
See Env S course descriptions, page 323.

Env S 444 Land Evaluation and Resources Management
See Env S course descriptions, page 323.

Design

The courses in design studio combine design fundamentals and design concepts, along with the opportunity to involve analysis and synthesis, professional and scientific insights, application of tools and methods for designing artifacts for man, and an awareness of the inherent physical characteristics and limitations of media and materials. The objectives of the studio are: (1) to guide the student in observing aspects of the physical and social environment; to find, categorize and associate the information into fundamental structures and patterns of relationships; (2) to apply theories generated in the lecture courses to situations in the physical environment, implementing by categorizing the courses into behaviour materials, structures and mechanical systems, behaviour of man, and communications; (3) to provide the student with an opportunity to develop skill in using different "techniques" for analyzing and synthesizing problems in the physical environment; (4) to establish a relationship between faculty and students; (5) to provide a vehicle for persons from faculties of different disciplines and from outside of the university to discuss with students their problems and projects from different points of view.

Arch 192 F IT,IS,8Std 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 to New York City (1 week).
Prereq: Architecture students only.

Arch 174/175
Experimental Courses
These courses offer a vehicle for introducing additional electives to the programme on a short term basis, and for developing future permanent courses.
Prereq: Consent of instructor

Arch 193 W IT,IS,14Std 1.5
Design Fundamentals and Studio
Reinforcement and development of the Arch 192 programme, but with emphasis upon the application of design method and practice to specific architectural problems.
Prereq: Architecture students only.

Arch 194 W 2C 0.5
Visual Interdisciplinary Language
Theory and practice of visual form based on formative processes and hierarchial structures.
Propositions: form follows process, rotation is a universal form-generating process, symmetric form is a result of an asymmetric process and freedom is the single organizing principle.
Prereq: Consent of instructor

Arch 252 W 0.5
Creative Problem Solving
Development of creative skills through group behaviour in problem solving sessions by: 1) developing a clear understanding of each participant’s own creative thought processes; 2) increasing his/her ability to consciously and deliberately make use of his/her own creative potential; 3) 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 274/275
Experimental Courses
These courses offer a vehicle for introducing additional electives to the programme on a short term basis, and for developing future permanent courses.
Prereq: Consent of instructor

Arch 284, 285  F,W  3C  0.5
Architectural Research
This offers a student an opportunity for independent research into architectural problems not offered in the regular curriculum, guided exploration of specific architectural problem areas, of appropriate complexity to the particular term.
Prereq: Approval of (in house) UGAC

Arch 292  F  3C, 11std  1.5
Design Concepts and Studio
To develop in each student the ability to design on a small, personal scale and explore design as a thinking process. Small space design exercises where the student is required to define and analyze a problem and generate an architectural solution. Solutions are refined through a series of evaluations.
Prereq: Architecture students only.

Arch 293,  S  3C, 11std  1.5
Design Concepts and Studio
Design involving problems of human perception and dimension in complex or large spaces, and to develop in each student the ability to generate solutions to architectural problems on a scale which involves “privacy and community”. Emphasis is placed on programming, analysis and solution evaluation. Problems of construction, servicing, and siting will be further explored. Field trip to Chicago (1 week).
Prereq: Architecture students only.

Arch 374/375
Experimental Courses
These courses offer a vehicle for introducing additional electives to the programme on a short term basis, and for developing future permanent courses.
Prereq: Consent of instructor

Arch 384, 385  F,W  R  0.5
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 392  W  4C, 17std  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 coordination of the design task with other disciplines involved in such projects.
Prereq: Architecture students only.

Arch 393  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 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: Architecture students only.

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 a 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.

Arch 142  F  4C, 2L  1.0
Iconography 1
Conventions
Selected schemes of order, such as fate, providence, natural law, the human will, as expressed in plays, poems, and fiction from various ages; selected conventions in literature, cinema, and the visual arts; the development of one or two archetypal symbols in literature and the visual arts; directed to lead into more detailed studies of symbolic patterns in Iconography 2.
Prereq: 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 human existence, culture, environment, as well as the working of the icon from raw state of perceived image to its function as an expressive symbol in poetry, music, dance, architecture and other works of art; a study of modern work in comparison to an ancient achievement.  
Required: Arch 142  

Arch 244  W 2C,2D  0.5  
History of Gardens of Europe and Western Asia  
The study of gardens as works of art reconciling man with his world. Gardens of Europe and Western Asia are studied as responses to specific human needs, the stress and aspirations of an age, and to the climate and landscape of the land in which they were created.  
Required: Arch 142, 143 and 246 for Architecture students and completion of first year for others or consent of instructor.  

Arch 245  W,S  1C,2L  0.5  
Survey of Contemporary Architecture  
Formative years in Europe, early North American scene, study of contemporary works in Architecture, analyses of important buildings of twentieth century. Philosophies of internationally known architects and designers. Study of the development of architectural styles, trends and schools of thought in North America and other countries.  
Required: Second year standing  

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.  
Required: Arch 143  

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 Reform through the Enlightenment until the French Revolution and Hume's dethronement of Reason. Field trips to museums, concerts in Toronto, Quebec, Detroit or Buffalo; Stratford Festival.  
Required: Arch 246  

Arch 282  F  3C,1ldtrip  0.5  
Preservation Practice-Background  
An introduction to the field of preservation of older buildings, particularly in Canada; reference will be made to the philosophies and attitudes towards the preservation of older buildings and will be combined with the study, in brief, of historical, social and architectural influences on Canadian building.  

Arch 345  W  2C,1S  0.5  
Architectural Theory 1850-1940  
An introduction to the development of architectural theory from the mid-19th century to the 2nd World War, through an examination of architectural movement and philosophies of the period and of the architecture, built and imagined, which they generated.  
Required: Consent of instructor  

Arch 346  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 fulfilling of natural law is replaced by a notion of order as the creation of the autonomous human wills. Selected works in philosophy, literature, art and architecture will be studied.  
Required: Arch 247 or consent of instructor.  

Arch 347  4C  0.5  
The Roots of Civilization  
The course attempts to establish a basis for the understanding of the functions of myth, ceremony and ritual, the structures of primitive and ancient built environments, man's attitude towards nature, and his use of the resource environment, the development of classical culture, and beginnings of science.  
Required: Arch 346 or consent of instructors
Courses for Bachelor of Architecture

(For Recommended Programme, see page 159). The courses for the Bachelor of Architecture Programme 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.

Arch 445 W 2C,2S 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 experiences; 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 455 W 2C 0.5
Management and Estimating
Exposure of the student to the administrative responsibilities of the practicing architect's work in the building industry, which includes: bidding, bid opening and analysis; contract award; administration of the contract; contractors organization; subcontractors: labour relations, estimating and cost control.

Arch 462 F 2C,2L 0.5
Structural Synthesis 1
Steel and Concrete Design
Design and behaviour of structural steel systems, application of current building specifications, proportioning structural elements based on pertinent design considerations, bolted and welded; criteria for choosing steel systems; introduction to plastic design.
Prereq: BES standing

Arch 463 W 2C,2L 0.5
Structural Synthesis 2
Concrete and Timber Designs
Design and behaviour of structural concrete systems, application of building specifications; analysis and design of concrete elements using ultimate strength principle; criteria for choosing structural concrete systems; introduction to prestressed concrete. Behaviour and design of modern wood structures; fasteners, ring connectors and their significance in timber construction; proportioning and design of sawn and laminated timber members.
Prereq: Arch 462

Arch 472 F 2C 0.5
Mechanical Systems 2
Heating, ventilating and air conditioning systems for buildings; plumbing and drainage; electrical distribution for power and light in buildings; illumination; acoustics, geometrics and materials; and vertical transportation systems.
Prereq: Arch 372

Arch 474/475
Experimental Courses
These courses offer a vehicle for introducing additional electives to the programme on a short term basis, and for developing future permanent courses.
Prereq: Consent of instructor
Arch 484,485  F,W  3R  0.5  
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  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. Term held in Rome or Waterloo.  
Prereq: Architecture students only.  

Arch 554  W  3C  0.5  
Development and Financing  
Introduction to the important determinants of the development, growth and re-planning of the various man environments, including development law, land use development, land use planning, appraisal, mortgage lending and accounting.  
Prereq: Arch 455  

Arch 555  S  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 563  W  3C  0.5  
Suspended and Space Structures  
State-of-the-art review of cable-suspended construction. Analysis of cable networks, basic equations. Effect of live loads on cables; dynamic considerations. Double cable systems; synclastics and anticlastic surfaces. Cable-stayed systems; analysis of space structures; space frames and roof systems; one and two-way design.  
Prereq: 4B architecture standing or equivalent  

Arch 574/575  
Experimental Courses  
These courses offer a vehicle for introducing additional electives to the programme on a short term basis, and for developing future permanent courses.  
Prereq: Consent of instructor  

Arch 584,585  W,S,  3R  0.5  
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  
The course provides 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 8 (4b) and all research work completed by the end of the 8 month co-op work term 5. Terms 9 and 10 (5a and 5b) will be spent developing the thesis for presentation during term 10. 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: Architecture students only.  

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 inter-disciplinary communications.  

Electives are divided into the following two categories:
Theme Elective (BES Degree) courses within the Faculty of Environmental Studies which deal with ecological issues. Theme Elective (BArch Degree) any course within the School of Urban and Regional Planning.

Each student pursuing a BES degree must have accumulated one and a half course credits in the theme area of Ecology by or before his/her 6th academic term.

Each student pursuing a BArch degree must have one half course credit in the theme area of Planning by or before his/her 10th academic term.

Free Elective Courses selected by the student without restrictions as long as the course is approved by Senate.

Note: Department approval is mandatory for both TE and FE.

Course Descriptions

Arts

Professors
W. Klaassen, BA (McMaster), BD (McMaster Divinity School), DPhil (Oxford) G
P. H. Smith, Jr., BA (Harvard), PhD (Pennsylvania) G
D. E. Smucker, BA (Bluffton), BD (Princeton Theological Seminary), MA, PhD (Chicago) G

Course Descriptions

Courses designated “Arts”, those listed below, usually cover some topics and themes of general interest to several disciplines and their presentation is often made with this interdisciplinary perspective in view. Arts courses are elective courses in General and Honours programmes and do not satisfy either the Group A or Group B requirements.

Arts 122G/123G F,W 2C,1D 0.5
Quest for Meaning in the 20th Century 1 and 2
Against the background of rapidly shifting values in western culture, this course asks the student to examine his or her perspective and then face the resources of others in answering the question of Who am I? What is my obligation to society? What is my relationship to the natural world? Is there an ultimate meaning to life? Teaching methods include personal statements, thematic and biographical books and films.

Arts 198 F 0.5
Introduction to Computer Technology
An introduction to the basic ideas of computers, with emphasis on the use of terminals, including word processing and file-maintenance (“database”) systems. The course will examine the future of computers and their political, ethical, and social impact. No previous knowledge of computing is assumed.

Arts 200G Issues in Mass Communication 1
Not offered 1981-82.

Arts 201G Issues in Mass Communication 2
Not offered 1981-82.

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.
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. Applications will include word indexes, text concordances, methods of computer-aided text comparison. Arts 212 will stress data management, interactive editors, formatters, and the use of programme utilities.

No previous knowledge of computing is assumed. 212 presupposes 211 or permission of the instructor.

Arts 215  Y  3C  1.0
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.

Prereq: none

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 Live By, and works by Aldous Huxley, Zamiatin, Turgenev, and Andres. The two major themes are Utopia, the yearning for and the shape of perfectibility, and Nihilism, the denial and/or destruction of “Old 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 Alienation, the divided self in exile, or the inability to give and to accept love.

Arts 220R  F  3C  0.5
Chinese Thought and Culture 1
An examination of traditional culture, institutions and the modern development of China as the context for the examination of contemporary Chinese society.

Chinese Thought and Culture 2
An investigation of the dynamics of the new China: education, medicine, the arts, the position of women, foreign policy, the Cultural Revolution and subsequent developments, rural and urban organization, the role of the army, the role of the Chinese Communist Party, and the philosophy of Mao Tse Tung.

Prereq: Arts 220R or consent of instructor.

Arts 230G  F  2C,1D  0.5
Non-Violence and Political Reality
This course will concentrate on the question of the possibility 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.

Current Problems in Family Life Education
The course will examine human sexuality from a biological, psychological, and social perspective. The significant principles of sex education and some of the most relevant methods and programmes will be discussed as well.

Basic Issues in Family Life Education
This course will study marriage and the family from psychological, sociological, philosophical and theological perspectives. Methods for incorporating significant knowledge about marriage and the family into family life programmes will also be given attention.

Arts 241R  Arts and Society 1
Not offered 1981-82

Arts 242R  Art and Society 2
Not offered 1981-82

Introduction to Peace Research 1 and 2
Not offered 1981-82.

Seminar on selected topics in Personality and Religion.

Special Topics in Chinese Thought and Culture
Not offered 1981-82
Arts 349J  J  1.0
Advanced Studies in Family Life and Sex Education
The course presents an in-depth analysis of select topics in human sexuality, giving special attention to the emotional aspects of sexuality, and also focuses on the evaluation of current family life and sex education programmes.
Prereq: Arts 249J.

Arts 350J  A  1.0
Advanced Studies in Family Life Education
An in-depth analysis of select topics in marriage and family life, especially their emotional aspects, including an evaluation of family life education in school and community.
Prereq: Arts 250J.

Arts 398G/399G
Special Topics in Peace and Conflict Studies
Students may arrange independent studies in the area of peace and conflict, with the approval of the PACS Faculty Group Chairperson.

Department of Biology

Professor, Chairman of Department
J. E. Thompson, BSA (Toronto), PhD (Alberta)

Associate Professor, Associate Chairman of the Department
R. G. H. Downer, MSc (Queen’s Belfast),
PhD (W. Ont.)

Professor, Graduate Officer
A. D. Harrison, MSc, PhD (Capetown)

Professor, Graduate Officer
C. H. Fernando, BSc (Ceylon), D Phil (Oxford)

Associate Professor, Undergraduate Officer
J. C. Carlson, MSc, PhD (Massachusetts)

Assistant Professor, Undergraduate Officer
W. R. Hawthorn, MSc (McMaster), PhD (W. Ont.)

Assistant Professor, Undergraduate Officer
C. A. Peterson, MSc (Alberta), PhD (California, Davis)

Professors
C. R. Barnes¹, BSc (Birmingham), PhD (Ottawa)
H. B. N. Hynes, PhD, DSc (London), ARCS, FRSC
W. E. Inniss, MSA (Toronto), PhD (Michigan State)
W. B. Kendrick, BSc, PhD (Liverpool)
J. Kruuv², MSc (Waterloo), PhD (W. Ont.)
J. K. Morton, BSc,PhD (Durham), FLS
J. J. Pasternak, MA (Toronto), PhD (Indiana)
G. Power, BSc (Durham), PhD (McGill)
J. Slivak *, LScO (Montreal), MS (Indiana), PhD (Cornell)

Associate Professors
R. D. Beauchamp*, BA (McMaster), MA, PhD (Brown)
J. C. H. Carter, BA (Toronto), MSc, PhD (McGill)
A. M. Charlee, MSc, PhD (Manitoba)
E. B. Dumbroff, MForestry, PhD (Georgia)
H. C. Duthie, BSc, PhD (Wales)
H. R. N. Eydt, MSc,PhD (McMaster)
M. Globus, MSc (McGill), PhD (Toronto)
A. G. Kempton, MSA (Toronto), PhD (Michigan State)
C. I. Mayfield, BSc, PhD (Liverpool)
P. E. Morrison, MSc (W. Ont.), PhD (McMaster)
G. G. Mulamoottii³, BSc (Mysore), MSc (Bombay), PhD (Delhi)
J. C. Semple, BSc (Tufts), MA,PhD (Washington U, St. Louis)
S. M. Smith, MSc (McMaster), PhD (Manitoba)
Recipient of the Distinguished Teacher Award
J. B. Theberge³, BScA (Guelph), MSc (Toronto),
PhD (Br. Col.)
K. Zachariah, BSc (Madras), BA Hons (Oxford),
MA, PhD (Princeton)
Assistant Professors
N. Bols, BSc (S Fraser), MSc (Br. Col.), PhD (Toronto)
M. E. Haight\(^1\), MSc, PhD (McMaster)
J. R. Lepock\(^2\), MS (W. Virginia), PhD (Penn. State)
L. W. Stobbs, MSc (Brock), PhD (Guelph)

Research Assistant Professors
A. Morgan, BSc (Leicester), MSc (Saskatchewan), PhD (Birmingham)
S. Vethamany-Globus, BSc, MA, MSc (Madras), PhD (Toronto)

Adjunct Faculty
F. F. Mallory, MSc (Laurentian), PhD (Guelph)
Wilfrid Laurier University

Faculty members holding cross appointments as shown
\(^1\)Biology and Earth Sciences
\(^2\)Biology and Physics
\(^3\)Biology and Urban and Regional Planning
\(^4\)Biology and Optometry

Course Descriptions

All Honours Biology students who have completed their third year are required to participate in an off-campus field course (Biol 497 or 498) before entering Year 4. These courses are held either in early Spring or the following September (after Labour Day). The cost of most trips will range from $100 to $500 per student.

Note
The Huntsman Marine Laboratory, St. Andrews, New Brunswick offers a summer course “Introduction to Marine Biology”. This course will be accepted as 0.50 transfer credit towards a BSc if taken by students of the University of Waterloo.

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 111L F 3L 0.25
Introductory Biology 1 Laboratory
A laboratory course only for students taking Biology 111. Take-home problems and/or assignments will alternate with in-house labs.
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 112L W 3L 0.25
Introductory Biology 2 Laboratory
A laboratory course only for students taking Biology 112. Labs. on alternate weeks.
Open to students other than those intending to major in Biology or to enter the School of Optometry.

Biol 201 Y 2C, 3L 1.0
Anatomy, Histology and Embryology
A systematic, anatomical and histological study of the human body and an introduction to basic embryology.
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.

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 - 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.

Biol 222 F, W, S 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 1981-82.)
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Term</th>
<th>Credits</th>
<th>Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biol 230</td>
<td>F</td>
<td>2C,3L 0.5</td>
<td>Introductory Cell Biology</td>
<td>An introduction to the concepts of cell biology with emphasis on (i) the</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>structural organization of the cell and its constituent organelles and (ii)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>the function of critical molecular processes that are characteristic of</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>living organisms.</td>
</tr>
<tr>
<td>Biol 233</td>
<td>W</td>
<td>2C,3L 0.5</td>
<td>Human Physiology</td>
<td>The physiology of the major organ systems including nervous, muscular,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>circulatory, respiratory, urinary, digestive, endocrine and reproductive</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>systems.</td>
</tr>
<tr>
<td>Biol 239</td>
<td>W</td>
<td>2C,3L 0.5</td>
<td>Genetics</td>
<td>The mendelian basis of genetic analysis. Chromosomal mechanisms in mitosis</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>and meiosis. The origin, inheritance and adaptive significance of</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>chromosomal changes. Nucleic acids as the carriers of genetic information.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Natural selection and the evolution of genetic systems.</td>
</tr>
<tr>
<td>Biol 240</td>
<td>F</td>
<td>2C,3L 0.5</td>
<td>Fundamentals of Microbiology</td>
<td>Introduction to fundamental theories, principles and methods of microbiology.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Structure, methods of cultivation, growth, effects of physical factors, and</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>inhibition and killing of microorganisms will be studied.</td>
</tr>
<tr>
<td>Biol 241</td>
<td>W</td>
<td>2C,3L 0.5</td>
<td>Introduction to the Microbial World</td>
<td>Biological characterization of major bacterial groups, microorganisms as</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>geochemical agents, utilization of microorganisms by man, and mechanisms of</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>microbial pathogenicity.</td>
</tr>
<tr>
<td>Biol 245</td>
<td>F</td>
<td>2C,3L 0.5</td>
<td>General Microbiology 1</td>
<td>History and scope of microbiology. Study of the characteristics of bacteria</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>and other microorganisms.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>*Open to students other than those intending to major in Biology or to enter</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>the School of Optometry.*</td>
</tr>
<tr>
<td>Biol 246</td>
<td>W</td>
<td>2C,3L 0.5</td>
<td>General Microbiology 2</td>
<td>Relationships of microorganisms to man and his environment. *Prereq: Biol</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>245*</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>*Open to students other than those intending to major in Biology or to enter</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>the School of Optometry.*</td>
</tr>
<tr>
<td>Biol 250</td>
<td>F</td>
<td>3C/fldlab 0.5</td>
<td>Ecology</td>
<td>An introduction to the study of the relationships of plants and animals to</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>their environment. The nature of ecosystems, ecological energetics,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>biogeochemical cycling, community ecology, introduction to population</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>biology. Field trips as required.</td>
</tr>
<tr>
<td>Biol 301</td>
<td>Y</td>
<td>2C,3L 1.0</td>
<td>Human Physiology</td>
<td>The physiology of the major organ systems of the body. The topics discussed</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>include circulation, respiration, digestion and nutrition, metabolism,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>muscle, nervous system, special senses, and the endocrine system.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td><em>(For Optometry students only)</em></td>
</tr>
<tr>
<td>Biol 311</td>
<td>W</td>
<td>2C,3L 0.5</td>
<td>Vertebrate Zoology</td>
<td>Major topics in vertebrate zoology as exemplified by both living and fossil</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>members of the subphylum Craniata.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td><em>Prereq: Biol 211</em></td>
</tr>
<tr>
<td>Biol 332</td>
<td>W</td>
<td>2C,3L 0.5</td>
<td>Arthropod Zoology</td>
<td>A survey of the phylum Arthropoda, including the insects, with emphasis on</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>their classification, interrelationships and ways of life.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td><em>Prereq: Biol 210</em></td>
</tr>
<tr>
<td>Biol 333</td>
<td>F</td>
<td>2C,3L 0.5</td>
<td>Invertebrate Zoology</td>
<td>A survey of the major invertebrate phyla other than the arthropods, with</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>emphasis on their functional anatomy, classification and ways of life.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td><em>Prereq: Biol 210</em></td>
</tr>
<tr>
<td>Biol 334</td>
<td>F</td>
<td>2C,3L 0.5</td>
<td>The Flowering Plants</td>
<td>A study of floral morphology in relation to classification and evolution.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>An introduction to taxonomy and nomenclature. History of taxonomy.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>*(Students entering this course are required to make a flowering plant</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>collection. Instructions should be obtained from the Herbarium prior to the</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>summer break.</td>
</tr>
</tbody>
</table>
| Biol 335   | F    | 2C,3L 0.5 | Identification and Variety of Microorganisms | Principles of classification and identification of microorganisms. Identification procedures and systems. The study of selected groups of transitional microorganisms. *Prereq: Biol 240-241 or permission of instructor
Biol 337  W  2C,3L  0.5  
**Microorganisms in Foods**
Food preservation, spoilage, poisoning and modern concepts in quality assurance programmes 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 335 or permission of instructor*

Biol 338  W  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*

Biol 340  W  2C,3L  0.5  
**Molecular Biology**
Molecular biological aspects of chromosome replication, expression of genetic information, functional translation of specific eukaryotic proteins, cell division, gamete formation, embryogenesis, hormone action, cellular interactions and cell differentiation.

Biol 341  F  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 121-122, 121L-122L or 230*

Biol 343  F  2C,3L  0.5  
**Histology and Cytology**
The structure of mammalian cells, tissues and organs interpreted in functional terms. Cell reproduction and differentiation, with some discussion of the embryological origin of tissues and the regulation of tissue growth. Light and electron microscopy techniques.
*Prereq: Biol 121-122, 121L-122L or 211 or 230 or 233*

Biol 345  W  2C,3L  0.5  
**Plant Physiology**
An integrated study of plant function: the dynamics of nutrient and water movement, photosynthesis, control mechanisms of growth and development.
*Prereq: Biol 220*

Biol 346  F  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 347  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 232 or 221*

Biol 348  F  2C,3L  0.5  
**Vertebrate Physiology 1**
A general study of selected physiological topics in vertebrates including nutrition, digestion, respiration and circulation.

Biol 349  W  2C,3L  0.5  
**Vertebrate Physiology 2**
A general study of selected physiological topics in vertebrates including nerve and muscle physiology, endocrinology, osmoregulation and excretion.

Biol 350  W  2C,3L  0.5  
**Environmental Toxicology 1**
An introduction to the basic theories, principles and techniques of environmental toxicology. A comparative study of the effects of specific groups of toxicants on ecosystems; biodegradation and cycling.

Biol 430  F  2C,3flab/T  0.5  
**The Analysis of Communities**
Sampling procedures to estimate abundance and distribution of organisms in time and space. Methods to analyze succession. The classification and ordination of ecosystems. The response of ecosystems to exploitation. The role of biological management in conservation programmes.
*Prereq: Biol 231 or 250 and Stat 202*

Biol 431  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 346*
Biol 433  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 434  W  3C/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.
(Of offered every other year. Alternates with Biol 438)

Biol 436  F  2C,3L  0.5
Quaternary Ecology
A consideration of the Quaternary environment. Pollen, plant macrofossil and faunal remains as indicators of past environments. Relationship of fossil assemblages to modern ecosystems. Pollen analysis and the interpretation of fossil deposits.
Prereq: an introductory course in biology or geology, or permission of the instructor.

Biol 437  W  3C/S  0.5
Biosystematics and Evolution
A study of the processes of evolution: the differentiation of populations and the origin of new forms of life.
Prereq: Biol 239

Biol 438  W  3C/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.
(Of offered every other year. Alternates with Biol 434)
Prereq: Biol 340
Offered in Winter Term 1982

Biol 440  F  2C,3L  0.5
Plant Growth and Development
A study of the plant hormones and the mechanics that control growth, dormancy and development.

Biol 441  W  2C,3L  0.5
Stress Physiology and Aging in Plants
A study of stress tolerance and aging in plants. Mechanisms of adjustment to temperature, moisture, salt and chemical stress will be emphasized.
Prereq: Biol 345
(Not offered in 1981-82.)

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 337

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 335, 451

Biol 445  W  2S,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 347

Biol 446  W  2C,3L  0.5
Physiology
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 232

Biol 447  F  3C  0.5
History of Biology
The development of biological thought from Greek and Roman times to the present; i.e. from classification to the present experimental approach.
(Not to be taken in conjunction with Sci 400)

Biol 448  F  2C,3L  0.5
Developmental Biology
Analysis of embryonic development of selected organisms with emphasis on growth and the processes of sub-cellular, cellular and organ differentiation stressing recent experimental methodology.

Biol 449  W  2C,3L  0.5
Virology
The nature of viruses and their interaction with their plant, microbial and animal hosts.
Prereq: Biol 235 or 240-241

Biol 450  F  2C,3S/Flab  0.5
Aquatic Biology
An introduction to the physics, chemistry and biology of the marine and freshwater environments.
Prereq: Biol 332 or 333; 497.
N.B. Limited to 24; priority will be given to Honours students.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Term</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biol 451</td>
<td>F</td>
<td>2C,3L</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Physical and biological properties of immunological agents that protect against disease, the procedures for their identification and their practical applications.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Prereq: Biol 235 or 240-241</td>
</tr>
<tr>
<td>Biol 452</td>
<td>F</td>
<td>2C,3L</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>A comparative study of respiratory, circulatory and endocrinological systems of animals: emphasis will be placed on invertebrate groups.</td>
</tr>
<tr>
<td>Biol 453</td>
<td>W</td>
<td>2C,3L</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>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.</td>
</tr>
<tr>
<td>Biol 455</td>
<td>F</td>
<td>2C,3L</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Cellular, developmental and physiological effects of toxicants on multicellular organisms.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Prereq: Biol 350</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Offered in Fall term 1981</td>
</tr>
<tr>
<td>Biol 456</td>
<td>F</td>
<td>2C,3L</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Prereq: Biol 235 or 240-241, or permission of instructor.</td>
</tr>
<tr>
<td>Biol 457</td>
<td>W</td>
<td>2C,3L</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>A study of the environmental impact of microorganisms. Aspects of pollution, waste, treatment, biodegradation of environmental contaminants, and nutrient cycling will be examined.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Prereq: Biol 235 or 240-241: 456, or permission of instructor.</td>
</tr>
<tr>
<td>Biol 458</td>
<td>F</td>
<td>2C,3L</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Prereq: Biol 235 or 240-241, or permission of instructor.</td>
</tr>
<tr>
<td>Biol 459</td>
<td>W</td>
<td>2C,3L</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>A study of the physiology of microorganisms with emphasis on the metabolic mechanisms of fermentative microbes, cellular and sub-cellular protein synthesis including turnover of ribosomes, inhibition by antibiotics and the quantitative techniques used to elucidate the mechanisms of protein biosynthesis.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Prereq: Biol 235 or 240-241; 458, or permission of instructor.</td>
</tr>
<tr>
<td>Biol 497</td>
<td>F,W,S</td>
<td>fidlab</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>The aim of this course is to provide able undergraduate students the opportunity to pursue original research, under the close supervision of a member of the Biology department. The results of this study will be presented in thesis form and will be critically examined by members of this and, where pertinent, other departments. Before selecting this course students must obtain approval for doing so from both the professors under whose direction they wish to work and the undergraduate officers in Biology. Normally, only students attaining at least a 75% average in the major field(s) will be accepted into this course.</td>
</tr>
<tr>
<td>Biol 498</td>
<td>F,W</td>
<td>fidlab</td>
<td>0.25</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Required of all honours biologists except those who take Biol 497. This general interest field course usually of one week duration may be one of several arranged or approved by the Department and is usually taken after completion of third year.</td>
</tr>
<tr>
<td>Biol 499</td>
<td>Y</td>
<td>1.0</td>
<td>Senior Honours Project</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>The aim of this course is to provide able undergraduate students the opportunity to pursue original research, under the close supervision of a member of the Biology department. The results of this study will be presented in thesis form and will be critically examined by members of this and, where pertinent, other departments. Before selecting this course students must obtain approval for doing so from both the professors under whose direction they wish to work and the undergraduate officers in Biology. Normally, only students attaining at least a 75% average in the major field(s) will be accepted into this course.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Graded on a Credit/No Credit basis.</td>
</tr>
</tbody>
</table>
Canadian Studies

Professor, Chairman of the Canadian Studies Programme Board
R. R. Krueger, BA, MA (W. Ont.), PhD (Indiana)

Assistant Professor, Director of the Programme
S. E. McMullin, BA, MA (Carleton), PhD (Dalhousie)

Members of the Canadian Studies Programme Board
Professors:
D. W. Hoffman, BSA, MSA (Toronto) PhD (Waterloo)
J. H. Hotson, BA (Colorado College), MA, PhD (Penn)

Associate Professors
T. S. Abler, BA (Northwestern), MS (Wisconsin-Milwaukee), PhD (Toronto)
J. R. Dugan, BA, MA (Toronto), PhD (Yale)
F. C. Gerard, MA (College St. Dominique, France),
BD (McGill), STM (McGill), PhD (Hartford, Conn)
A. Hunter, BA (Br. Col.), MA, PhD (Columbia)
R. F. Keith, BSA (Guelph), MA, PhD (Michigan State)
W. R. MacNaughton, BA (Toronto), MA, PhD (Wisconsin)

Assistant Professors
D. J. Horton, BA (Wat. Luth.), MA (Waterloo), PhD (McGill)
R. D. Legge, BA (Transylvania), STB (Harvard), PhD (McMaster)
J. E. Robinson, BSc (Waterloo), MES (York)
R. J. Williams, BA, MA, (McMaster), PhD (Toronto)

Participating Faculty (1979-80)

Professors
R. R. Krueger, BA, MA (W. Ont.), PhD (Indiana)
J. M. Wilson, BA, MA (Toronto)

Assistant Professors
D. J. Horton, BA (Wat. Luth.), MA (Waterloo), PhD (McGill)
S. E. McMullin, BA, MA (Carleton), PhD (Dalhousie)
P. Socken, BA (Toronto), MA (Iowa), PhD (Toronto)

Lecturer
S. D. Burt, BA, MA (Waterloo)

Core Courses

Cdn St 201  F  2C,1S  0.5
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.

Cdn St 202  W  2C,1S  0.5
Cultural Regionalism
Lecturers discuss the contribution made by literature, film, drama, and fine arts in defining distinctive regional identities in Canada. Particular attention is paid to the emergence of a distinctive Ontario culture.

Cdn St 301  F  3S  0.5
Regionalism: West
This course continues the exploration of Canadian regionalism by applying knowledge gained in Cdn St 201/202 to distinctive problems of the Canadian west and northwest. The focus of the seminar will vary according to the interests of the faculty and students.
Prereq: Cdn St 201 or 202

Cdn St 302  W  3S  0.5
Regionalism: East
This course continues the exploration of Canadian regionalism by applying knowledge gained in Cdn St 201/202 to distinctive problems of Atlantic Canada. The focus of the seminar will vary according to the interests of the faculty and students.
Prereq: Cdn St 201 or 202

Cdn St 400  Y  T.  1.0
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.
Prereq: Cdn St 301/302

The core course for each year of the programme is an inter-disciplinary study of Canadian problems, offered either in a lecture/tutorial format or a seminar format (depending on the number of students registered), and staffed by interested faculty members of the participating departments of the University and by eminent scholars from other parts of Canada who will visit the University for brief or extended periods during the year.
### Principal Canadian Content Courses Offered by the Participating Departments

#### Anthropology
- Anth 102A: Introduction to Social and Cultural Anthropology
- Anth 203: Prehistoric Man in North America
- Anth 205: Race and Racism in Canada
- Anth 230: Indians of Canada
- Anth 233: Eskimo Cultures
- Anth 241: The Contemporary Canadian Indian Scene
- Anth 322: Prehistoric Man in the Great Lakes Area
- Anth 333: Canadian Communities and Planned Change
- Anth 334: Ethnicity and Ethnic Diversity in Canada
- Anth 377: Early Man in the New World
- Anth 499: Honours Essay

#### Economics
- Econ 100A/B: Introduction to Modern Economics
- Econ 101: Introduction to Microeconomics
- Econ 102: Introduction to Macroeconomics
- Econ 241: Cost-Benefit Analysis and Project Evaluation
- Econ 263: Economic History of Canada
- Econ 333: Interregional Economics
- Econ 341: Public Finance
- Econ 343: Urban Economics
- Econ 345: Industrial Organization
- Econ 351: Labour Economics
- Econ 353: Population Economics
- Econ 355: Economics of Energy and National Resources
- Econ 363: Contemporary Canadian Problems
- Econ 364: Contemporary Canadian Problems

#### French
- Fr 151: Basic French (For students who have not passed the equivalent of Year 5 French)
- Fr 152: Basic French (For students who have not passed the equivalent of Year 5 French)
- Fr 192: French Language
- Fr 195: French Literature 1
- Fr 196: French Literature 2
- Fr 205: Spoken French
- Fr 206: Spoken French
- Fr 207: Spoken French
- Fr 208: Spoken French
- Fr 250: Intensive Language Training
- Fr 273: Aspects of Québec
- Fr 274: Survey of French-Canadian Literature
- Fr 300: Advanced Instruction in Written French
- Fr 375: Contemporary French-Canadian Novel
- Fr 401: Advanced Language Study
- Fr 402: Advanced Language Study
- Fr 471: French-Canadian Poetry
- Fr 472: Contemporary Québec Theatre
- Fr 501: Problems of French Language
- Fr 502: Problems of French Language

#### Geography
- Geog 251: Cities in Canada
- Geog 300: Geomorphology and the Southern Ontario Environment
- 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 of Canadian Cities
- Geog 411: Resource Studies
- Geog 422: Canada

#### History
- Hist 102E: Canadian History
- Hist 201X: Canadian Urban History
- Hist 203X: Modern Quebec
- Hist 204X: Life on the Ontario Frontier
- Hist 205X: Canadian Business History
- Hist 206X: History of Canadian Minorities
- Hist 245G: Canadian Minorities 1
- Hist 246G: Canadian Minorities 2

#### Environmental Studies
- Env S 195A: Introduction to Environmental Studies
- Env S 195B: Introduction to Environmental Studies
- Env S 201: Introduction to Environmental and Planning Law
- Env S 333: Parkland Management
- Env S 401: Environmental Law
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hist 247G</td>
<td>Mennonite History 1 (1525-1920)</td>
</tr>
<tr>
<td>Hist 248G</td>
<td>Mennonite History 2 (1920-1975)</td>
</tr>
<tr>
<td>Hist 253X</td>
<td>Canadian History: 1760-1900</td>
</tr>
<tr>
<td>Hist 254X</td>
<td>Canadian History: 1900-1979</td>
</tr>
<tr>
<td>Hist 322</td>
<td>History of Canadian-American Relations Since 1914</td>
</tr>
<tr>
<td>Hist 325</td>
<td>History of Canadian Indians to 1870's</td>
</tr>
<tr>
<td>Hist 326</td>
<td>History of Canadian Indians since 1870's</td>
</tr>
<tr>
<td>Hist 351</td>
<td>Canadian Black History</td>
</tr>
<tr>
<td>Hist 386</td>
<td>Ontario History to Confederation</td>
</tr>
<tr>
<td>Hist 387</td>
<td>Ontario History Since Confederation</td>
</tr>
<tr>
<td>Hist 403X</td>
<td>Senior Seminar: The History of Modern Quebec</td>
</tr>
<tr>
<td>M Env 338</td>
<td>Social Impact Assessment</td>
</tr>
<tr>
<td>M Env 351</td>
<td>Organizations and Environmental Management</td>
</tr>
<tr>
<td>M Env 356</td>
<td>Canadian Non-renewable Resources (Cross-listed as Sci 350)</td>
</tr>
<tr>
<td>M Env 385</td>
<td>Technology/Lifestyles for a Conserver Society</td>
</tr>
<tr>
<td>M Env 400</td>
<td>Senior Honours Seminar (See also Env St 195B, 201, 333, 401)</td>
</tr>
<tr>
<td>P Sci 102C</td>
<td>Politics in Action</td>
</tr>
<tr>
<td>P Sci 102D</td>
<td>Political Power and the Political Process</td>
</tr>
<tr>
<td>P Sci 102F</td>
<td>Populism</td>
</tr>
<tr>
<td>P Sci 102H</td>
<td>Citizen Participation in Canada</td>
</tr>
<tr>
<td>P Sci 102M</td>
<td>Contemporary Issues in Canadian Public Policy</td>
</tr>
<tr>
<td>P Sci 260</td>
<td>Canadian Government and Politics</td>
</tr>
<tr>
<td>P Sci 260A</td>
<td></td>
</tr>
<tr>
<td>P Sci 272</td>
<td>Political Behaviour 2</td>
</tr>
<tr>
<td>P Sci 291</td>
<td>The Canadian Legal Process</td>
</tr>
<tr>
<td>P Sci 292</td>
<td>Issues in Canadian Criminal Law</td>
</tr>
<tr>
<td>P Sci 293</td>
<td>Political Journalism</td>
</tr>
<tr>
<td>P Sci 331</td>
<td>Public Administration 1</td>
</tr>
<tr>
<td>P Sci 332</td>
<td>Public Administration 2</td>
</tr>
<tr>
<td>P Sci 333</td>
<td>Administrative Law</td>
</tr>
<tr>
<td>P Sci 341</td>
<td>Provincial Politics</td>
</tr>
<tr>
<td>P Sci 342</td>
<td>Politics in Quebec</td>
</tr>
<tr>
<td>P Sci 343</td>
<td>Canadian Municipal Government</td>
</tr>
<tr>
<td>P Sci 344</td>
<td>The Politics of Local Government</td>
</tr>
<tr>
<td>P Sci 351</td>
<td>Comparative Federal Systems</td>
</tr>
<tr>
<td>P Sci 352</td>
<td>Comparative Legislative Systems</td>
</tr>
<tr>
<td>P Sci 363</td>
<td>Canadian Constitutional Law</td>
</tr>
<tr>
<td>P Sci 374</td>
<td>Interest Group Politics</td>
</tr>
<tr>
<td>P Sci 428</td>
<td>The State and Economic Life</td>
</tr>
<tr>
<td>P Sci 431</td>
<td>Canadian Public Policy</td>
</tr>
<tr>
<td>P Sci 435</td>
<td>The Politics of Canadian Resource Development</td>
</tr>
<tr>
<td>P Sci 442</td>
<td>Politics in Ontario</td>
</tr>
<tr>
<td>P Sci 461</td>
<td>Problems in Canadian Politics 1</td>
</tr>
<tr>
<td>P Sci 462</td>
<td>Problems in Canadian Politics 2</td>
</tr>
<tr>
<td>P Sci 473</td>
<td>Voting Behaviour</td>
</tr>
<tr>
<td>P Sci 475</td>
<td>Political Socialization</td>
</tr>
<tr>
<td>P Sci 476</td>
<td>Research Seminar in Political Behaviour</td>
</tr>
<tr>
<td>P Sci 486</td>
<td>Middle Powers and World Politics</td>
</tr>
<tr>
<td>Soc 101</td>
<td>Introduction to Sociology</td>
</tr>
<tr>
<td>Soc 102</td>
<td>Social Problems</td>
</tr>
<tr>
<td>Soc 103</td>
<td>Canadian Society</td>
</tr>
<tr>
<td>Soc 120R</td>
<td>Fundamentals of Sociology</td>
</tr>
<tr>
<td>Soc 200</td>
<td>Marriage and the Family</td>
</tr>
<tr>
<td>Soc 206</td>
<td>Sociology of Sex Roles</td>
</tr>
<tr>
<td>Soc 209</td>
<td>Family Origin &amp; Personal Identity</td>
</tr>
<tr>
<td>Soc 214</td>
<td>Social Inequality</td>
</tr>
<tr>
<td>Soc 223</td>
<td>Deviance: Perspectives and Processes</td>
</tr>
<tr>
<td>Soc 224</td>
<td>Law and Order</td>
</tr>
<tr>
<td>Soc 227</td>
<td>Crime and Society</td>
</tr>
<tr>
<td>Soc 242</td>
<td>Industrial Sociology</td>
</tr>
<tr>
<td>Soc 248</td>
<td>Health, Illness and Society</td>
</tr>
<tr>
<td>Soc 253</td>
<td>Population in Canadian Society</td>
</tr>
<tr>
<td>Soc 256</td>
<td>Ethnic and Racial Relations</td>
</tr>
<tr>
<td>Soc 267</td>
<td>Sociology of the Contemporary University</td>
</tr>
<tr>
<td>Soc 327R</td>
<td>Canadian Ethnic and Cultural Minorities</td>
</tr>
<tr>
<td>Soc 328R</td>
<td>Canadian Ethnic and Cultural Minorities</td>
</tr>
<tr>
<td>Soc 342</td>
<td>Sociology of Industrial Relations</td>
</tr>
<tr>
<td>Soc 343</td>
<td>Sociology of Health Care</td>
</tr>
<tr>
<td>Plan 156</td>
<td>Introduction to Urban and Regional Planning Concepts</td>
</tr>
<tr>
<td>Plan 222</td>
<td>Canadian Regional Issues</td>
</tr>
<tr>
<td>Plan 225</td>
<td>Planning Surveys and Analysis</td>
</tr>
<tr>
<td>Plan 330</td>
<td>Urban Social Planning</td>
</tr>
<tr>
<td>Plan 332</td>
<td>The Sociology of Regions</td>
</tr>
<tr>
<td>Plan 333</td>
<td>The Sociology of Regional Planning</td>
</tr>
<tr>
<td>Plan 342</td>
<td>Urban and Regional Planning 1</td>
</tr>
<tr>
<td>Plan 343</td>
<td>Urban and Regional Planning 2</td>
</tr>
<tr>
<td>Plan 344</td>
<td>Principles of Recreation Planning</td>
</tr>
<tr>
<td>Plan 356</td>
<td>Regional Planning and Development</td>
</tr>
<tr>
<td>Plan 370</td>
<td>Land Development Planning</td>
</tr>
<tr>
<td>Env S 401</td>
<td>Environment Law</td>
</tr>
<tr>
<td>Env S 402</td>
<td>Planning Law</td>
</tr>
<tr>
<td>Plan 414</td>
<td>Housing Policies</td>
</tr>
<tr>
<td>Plan 430</td>
<td>Social Policy Planning</td>
</tr>
<tr>
<td>Plan 431</td>
<td>Citizen Involvement, Planning and Social Change</td>
</tr>
</tbody>
</table>
Principal Canadian Content Courses Offered by Other Arts Departments

**Fine Arts**
- Fine 316: Canadian Art
- Fine 317: Canadian Art

**Inter-Disciplinary Social Science**
- ISS 221R: Community Issues

**Philosophy**
- Phil 225: Social and Political Philosophy: Canadian Problems

**Psychology**
- Psych 212: Educational Psychology
- Psych 454: Senior Seminar in Educational Psychology

**Religious Studies**
- RS 220: Evangelical Christianity
- RS 221: Minority Religions in North America
- RS 264: Religion in the Canadian Experience
- RS 265: Unity and Diversity in Canadian Religion
- RS 268B: Religious Perspectives in Contemporary Canadian Literature

---

**Department of Chemical Engineering**

**Professor, Chairman of Department**
E. Rhodes, BSc Tech, MSc Tech, PhD (Manchester), PEng

**Professor, Associate Chairman (Graduate Studies)**
T. Z. Fahidy, BSc, MSc (Queen's), PhD (Illinois), PEng

**Associate Professor, Associate Chairman (Undergraduate Studies)**
G. S. Mueller, BASc (Waterloo), MSc, PhD (Manchester), PEng

**Professor, Associate Dean, Graduate Studies**
D. S. Scott, BSc, MSc (Alberta), PhD (Illinois), PEng

**Professor, Director of General Studies Programme**
T. L. Batke, BASc, MASC, PhD (Toronto)

**Professors**
- J. J. Byerley, BASc, MASC (Toronto), PhD (Br. Col.)
- K. S. Chang, BS (Hanyang Inst. Tech., Seoul), MSc, PhD (Northwestern)
- F. A. Dullien, Dipl Ing (Budapest Technical University)
  - MASC, PhD (Br. Col.), PEng
- R. Y-M Huang, BSc (National Taiwan University), MASC, PhD (Toronto)
- R. R. Hudgins, UE, BASc, MASC (Toronto)
  - MA, PhD (Princeton)
- M. Moo Young, BSc (London), MASC (Toronto), PhD (London), PEng
- K. F. O'Driscoll, BChE (Pratt Inst.), MA, PhD (Princeton)
- D. C. T. Pei, BEng (McGill), MASC (Queen's), PhD (McGill)
- P. M. Reilly, UE, BASc (Toronto), DIC, PhD (London), PEng
- G. L. Rempe, BSc, PhD (Br. Col.)
- A. Rudin, BSc (Alberta), PhD (Northwestern)
- P. L. Silveston, BS, MS (MIT), Dr Ing (Munich), PEng
- D. R. Spink, BS (Mich), MS (Rochester), PhD (Iowa State), PEng
- G. A. Turner, BSc (London), PhD (Manchester)
- B. M. E. van der Hoff, Ing (Amsterdam), Ir (Delft)

**Professor Emeritus**
A. H. Heatley, BSc, MA, PhD (Toronto)
Associate Professors
L. E. Bodnar, BA, MA (Sask.), PhD (McMaster)
C. M. Burns, BASc, MSc (Toronto), PhD (Polytechnic Inst., Brooklyn)
K. Enns, BASc, LLB, MSc, PhD (Toronto)
J. D. Ford, BEng (McGill), MSc, PhD (Toronto), PEng
C. E. Gall, BASc (Toronto), MSc (Queen's), PhD (Minn.), PEng
I. F. Macdonald, BEng (NSTC), PhD (Wisconsin)
C. W. Robinson, BASc (Br. Coll.), PhD (UC Berkeley)
J. R. Wynnyckyj, BEng (McGill), MSc, PhD (Toronto)

Assistant Professors
J. M. Scharer, BSc, PhD (Pennsylvania)
G. P. Sullivan, BASc (Waterloo); DIC, PhD (London), PEng

Faculty members having cross-appointments as shown
1Chemical Engineering and Philosophy
2Chemical Engineering and Chemistry
3Chemical Engineering, Management Science, and Statistics
4Chemistry and Chemical Engineering

Course Descriptions

Note:
Students whose registration in first year was prior to September 1979 follow a programme described in the 1980/81 calendar.

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 100 F 3C,1T,6L for first 6 weeks 0.75
Introductory Engineering Concepts 1
An introduction to the basic methods and principles used by engineers in the analysis and design of physical processes: units, dimensions, and measurements; mass balances; behaviour of fluids. Laboratory on visual communication is included.

Ch E 101 W,S 3C,1T,3L 0.75
Introductory 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,1T 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 solution, oxidation-reduction reactions, chemical kinetics.

Ch E 210 W,F 3C,1T 0.5
Transport Processes 1 (Equilibrium Stage Operations)
Equilibrium between phases; the equilibrium-stage concept. Cascades of stages with and without reflux; examples of their analysis when used to separate components by distillation, extraction, absorption and leaching. Introduction to computer methods for multicomponent mixtures.

Ch E 213 S,F 3C,2L 0.5
Transport Processes 2 (Fluid Mechanics)
Fundamentals of fluid flow; conservation laws for mass, momentum and mechanical energy; flow of fluid in conduits; flow past immersed bodies. Description, collection and separation of particulate systems.

Ch E 220 W,F 3C,1T 0.5
Applied Mathematics 1
Basic concepts of probability and their relevance to engineering decisions. Statistical frequency distributions, tests of significance, correlations, curve fitting, sampling theory, applications: errors, design of experiments.

Ch E 230 W,F, 3C,1T 0.5
Physical Chemistry 1
Introduction to physical chemistry. Ideal and real gases, the kinetic theory of gases, first law of thermodynamics, thermochemistry, heats of reaction, second law, chemical equilibria in simple systems, phase equilibria in simple systems, third law.

Ch E 231 S,F 3C,1T 0.5
Physical Chemistry 2
Prereq: Ch E 230
Chemical Engineering

Ch E 232  W,F  3C  0.5  
Inorganic Chemistry 1  
Wave mechanics, atomic structure and the periodic table, chemical bonding, structural chemistry of elements and compounds, introductory transition metal chemistry, some thermodynamic aspects of inorganic chemistry.

Ch E 233  S,F  3L  0.5  
Physical Chemistry Laboratory  
Experiments on viscosity of gases and liquids, chemical kinetics, adsorption, homogeneous and heterogeneous catalysis, thermochemistry, phase equilibria, diffusion, determination of molecular weight of polymers, training in technical report writing.

Ch E 314  W,S  3C,1T  0.5  
Transport Processes 3 (Heat Transfer)  
Introduction to heat transfer, momentum-heat transfer analogies and dimensional analysis, steady and transient heat conduction, convection and applications to engineering problems, radiant heat transfer and heat transfer with change of phase.  
Prereq: Ch E 213

Ch E 317  W,F  3C,1T  0.5  
Transport Processes 4 (Mass Transfer)  
Mass transfer by molecular and turbulent motion, heat-mass transfer analogies, mass transfer models and application to separations such as: distillation, absorption, adsorption, extraction etc.; simultaneous heat and mass transfer in gas-liquid contacting and solids drying; introduction to mass transfer with chemical reaction.  
Prereq: Ch E 314

Ch E 320  W,S  3C  0.5  
Applied Mathematics 2  
Gamma-Beta- and error-functions; sine, cosine, exponential- and elliptic-integrals, linear differential equations; Wronskian, Green function; initial and boundary value problems; Bessel functions; Fourier series, integrals and transforms; orthogonal functions; Laplace transforms; applications.

Ch E 321  W,F  3C  0.5  
Process Dynamics and Control 1  
Block and signal flow diagrams, proportional-integral-derivative controllers, frequency response techniques, analytical and graphical stability criteria. Introduction to modern control theory.  
Prereq: Math 216, Ch E 314

Ch E 330  W,S  3C  0.5  
Chemical Engineering Thermodynamics  
Thermodynamics of flow processes, vapour power plants, internal combustion engines, liquefaction of gases, refrigeration and evaporation, chemical equilibria in chemical reactions, thermal pollution, the energy crisis, efficient energy utilization and thermodynamics.  
Prereq: Ch E 231

Ch E 331  W,F  3C  0.5  
Chemical Reaction Engineering  
Homogeneous reactors; batch, CSTR, tubular flow systems, ideal models, residence time distributions in ideal reactors, temperature effects, steady states, semi-batch systems, nonideal behaviour. Heterogeneous catalysis; mass transfer effects; catalytic rate equations, fixed and fluidized bed reactors.  
Prereq: Ch E 231

Ch E 332  W,S  3C  0.5  
Inorganic Chemistry 2  
Introductory electrochemistry; electrolysis, electrolytic conductance and transport, reversible electrode processes, irreversible electrode processes and electrode kinetics, electrochemical measurements and their analytical applications, chemistry of corrosion.  
Prereq: Ch E 322

Ch E 333  W,F  3L  0.5  
Instrumental Methods of Chemical Analysis  
An introduction to modern analysis including optical, electrochemical, radiochemical, chromatographic and spectroscopic methods.

Ch E 382  W,S  3C  0.5  
Engineering Economics and Process Design 1  
Mathematics of annuities, mortgages, bonds and small loans; cost accounting, including direct costing, depreciation, taxes and financial statements. Sizing and costing of piping and heat transfer equipment; design of process components.

Ch E 410  S,F  6L  0.5  
Chemical Engineering Laboratory  
Experimental applications of physical and chemical principles using pilot scale equipment, experiments illustrating major unit operations (distillation, absorption, extraction, drying, humidification)  
Prereq: Ch E 314
Ch E 484  S,F  3C  0.5  
**Engineering Economics and Process Design 2**
Estimation of sales, and capital and operating costs of a new process or products; study of criteria for the appraisal of capital and expenditures; critical path methods; linear programming. Sizing and costing of mass transfer and other process equipment; design of processes.

Ch E 486  S,F  3C  0.5  
**Technical Seminar**
Each student will be expected to prepare and deliver a seminar on material from the recent literature or industrial experience, as well as an impromptu talk on a variety of topics. This course is graded CR or NCR, and CR must be obtained as a requirement for graduation.

Ch E 501  W  3C  0.5  
**The Chemical Engineer as an Entrepreneur**
How an individual engineer may develop a new small business to supply goods or services to Canadian chemical industries, while performing his/her own technical and management functions; technical, economic, legal and financial aspects.

Ch E 502  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 production performance, water flooding and enhanced recovery techniques.

Ch E 510  S,F  3C  0.5  
**Prediction of Physico-chemical Properties**
Methods of estimating physico-chemical properties of gases and liquids in cases where experimental values are absent. Prediction is usually based on correlations of a form suggested in part by theory, with empirical constants based on experimental data.

Ch E 515  W  3C  0.5  
**Two-Phase Flow Operations**
Introductory theory of one-dimensional two-phase flow: conventions, definitions, homogeneous theory, separated flow (Lockhart-Martinelli), particulate characterization and behaviour; applications: two-phase flow in pipes, boiling and evaporation, filtration.

Ch E 517  W  3C  0.5  
**Performance of Separation Processes**
Introduction, patterns of change and computational approaches, group methods, limited flows and stage requirements, capacity and efficiency of contacting devices, energy requirements, selection, optimal design and operation, mass transfer with chemical reaction.

Ch E 520  S,F  3C  0.5  
**Chemical Engineering Analysis**
Application of advanced mathematical techniques to the analysis of chemical engineering processes. 
*Prereq: Permission of Instructor*

Ch E 521  W  3C  0.5  
**Process Dynamics and Control 2**
Analog computation, time domain analysis, control of complex chemical systems. 
*Prereq: Ch E 420*

Ch E 523  W  4L  0.5  
**Process Control Laboratory**
Experiments on process dynamics, control and analog simulation of chemical processes. Time constant, step and frequency response, controller settings, cascade control of thermal, liquid level, and reaction systems. 
*Prereq: Ch E 420*

Ch E 540  S,F  3C  0.5  
**Introduction to Polymer Science**
Basic concepts of polymer chemistry, classification of polymers, introductory physical chemistry of polymers, organic chemistry of polymerization reactions of polymers, naturally occurring polymers.

Ch E 541  W  3C  0.5  
**Physical Chemistry of Polymers**
Polymer solutions, molecular characterization of polymers, molecular weight distributions, morphology and crystallinity in polymers, reaction kinetics and mechanism of addition and condensation polymerization. 
*Prereq: Ch E 540*

Ch E 543  W  3L  0.5  
**Polymer Laboratory**
Experimental studies of polymerization and physical properties of polymers: condensation and addition polymerization, copolymerization, molecular weight, extrusion rheology, etc. 
*Coreq: Ch E 541*
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Type</th>
<th>Credits</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ch E 550</td>
<td>W,F</td>
<td>3C 0.5</td>
<td>Introduction to Extractive Metallurgy</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Physical and chemical nature of ores and intermediates, introductory pyrometallurgy, hydrometallurgy and electrometallurgy, survey of extraction processes, application of the principles of thermodynamics and kinetics to metallurgical processes.</td>
</tr>
<tr>
<td>Ch E 551</td>
<td>W</td>
<td>3C 0.5</td>
<td>Metallurgical Chemistry</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Ionic equilibria, thermodynamics and kinetics of reactions in solution, bonding, stability and stereochemistry of coordination compounds and mechanisms of their reaction, introductory hydrometallurgy, corrosion and homogeneous catalysis.</td>
</tr>
<tr>
<td>Ch E 553</td>
<td>W</td>
<td>3C 0.5</td>
<td>Principles of High Temperature Extractive Metallurgy</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>In-depth discussion of several processes of importance in Canada: blast-furnace smelting (iron, lead, zinc), steel making and other specialized refining processes, pyrometallurgical treatment of sulfide ores, and fused salt electrolysis. The emphasis is on the interplay of the underlying thermodynamic, kinetic, transport, and process-engineering considerations.</td>
</tr>
<tr>
<td>Ch E 550</td>
<td>S,F</td>
<td>3C 0.5</td>
<td>Introduction to Biochemical Engineering</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Aspects of the life sciences of interest to the biochemical industries and to environmental pollution. Classification and growth characteristics of microorganisms. Physico-chemical properties of biological compounds. Metabolism and biochemical kinetics. Course includes some lab work.</td>
</tr>
<tr>
<td>Ch E 561</td>
<td>W</td>
<td>3C 0.5</td>
<td>Fermentation Operations</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>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. Course includes some lab work.</td>
</tr>
<tr>
<td>Ch E 563</td>
<td>W</td>
<td>3C 0.5</td>
<td>Food Processing</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>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.</td>
</tr>
<tr>
<td>Ch E 570</td>
<td>W,F</td>
<td>3C 0.5</td>
<td>Air Pollution</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Treatment of gaseous waste products from representative Canadian industries; characterization and toxicity of filtration, scrubbing, cycloning, electrostatic precipitation, and other chemical treatment, legal, socio-political, economic and engineering aspects.</td>
</tr>
<tr>
<td>Ch E 571</td>
<td>W</td>
<td>3C 0.5</td>
<td>Water Pollution</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Treatment of waste water from metals processing industries; waste characterization; toxicity; recycling; treatment by electro-oxidation/reduction, ion exchange, solvent extraction, absorption, electrodialysis, reverse osmosis, etc; economics, regulations, moral, legal. social and political implications.</td>
</tr>
<tr>
<td>Ch E 560</td>
<td>S,F</td>
<td>6L 0.5</td>
<td>Research-Design Project 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Individually supervised research and/or design project on any Chem Eng subject chosen by the student-professor group. Written report required.</td>
</tr>
<tr>
<td>Ch E 580</td>
<td>S,F</td>
<td>6L 0.5</td>
<td>Research-Design Project 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Continuation of Ch E 580. Equivalent to two one-term courses. A written report, meeting minimum technical report standards, and a public oral presentation will be required.</td>
</tr>
<tr>
<td>Ch E 583</td>
<td>W</td>
<td>2T,4L 0.5</td>
<td>Process System Design</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>The undergraduate curriculum is brought together to accomplish, by team effort, the basic objective of the process engineer: the design of an integrated process. A written report, meeting minimum technical report standards, and a public oral presentation will be required.</td>
</tr>
<tr>
<td>Ch E 585</td>
<td>W</td>
<td>6L 0.5</td>
<td>Technical Elective Project</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>An individually supervised research or design project, based on one of the technical elective courses taken in the 4A term. A written report, meeting minimum technical report standards, and a public oral presentation will be required.</td>
</tr>
<tr>
<td>Ch E 007</td>
<td>W,S,F</td>
<td>1C 0</td>
<td>General Awareness Seminar</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Informal discussions on the Chem Eng Programme.</td>
</tr>
</tbody>
</table>
Department of Chemistry

Professor, Chairman of Department
D. E. Irish, BSc (W. Ont.), MSc (McMaster), PhD (Chicago), FCIC

Professor, Associate Chairman of Department
R. G. Woolford, MSc (W. Ont.), PhD (Illinois), FCIC

Associate Professor, Associate Dean of the Faculty of Science
D. A. Brisbin, BSc (Alberta), PhD (Toronto)

Professor, (University of Guelph) Director of the Guelph-Waterloo Centre for Graduate Work in Chemistry
W. R. Fawcett, BA, PhD (Toronto)

Professors
A. J. Carty, BSc, PhD (Nottingham)
J. Cizek, RNDr (Charles University, Prague), CSc (Czechoslovak Academy of Sciences, Prague)
T. E. Gough, BSc, PhD (Leicester)
F. W. Karasek, BS (Elmhurst), PhD (Oregon State), FCIC
W. A. E. McBryde, MA (Toronto), PhD (Virginia), FCIC
F. R. McCourt, BSc, PhD (Br. Col.)
H. G. McLeod, MA, PhD (Toronto)
J. B. Moffat, BA, PhD (Toronto), FCIC
K. F. O'Driscoll, BChE (Pratt Inst.), MA, PhD (Princeton), FCIC
J. Palus, RNDr (Charles University, Prague), CSc (Czechoslovak Academy of Sciences, Prague)
W. B. Pearson, DFC, MA, DSc (Oxon), FRSC, FCIC
L. W. Reeves, BSc, PhD, DSc (Bristol), FRSC, FCIC
A. Rudin, BSc (Alberta), PhD (Northwestern)
G. Scoles, Dottore in Chimica (Genova), LibDoo, FCIC
H. D. Sharma, MSc (Delhi), PhD (California), FCIC
J. G. Smith, MA, PhD (Toronto), FCIC
V. A. Snieckus, BSc (Alberta), MS (California), PhD (Oregon), FCIC
T. Viswanatha, MSc, PhD (Mysore)

Adjunct Professor
B. O. Fraser Reid, MSc (Queen's), PhD (Alberta), FCIC
R. H. Marchessault, BSc (Montreal-Loyola), PhD (McGill)
R. G. A. Rodrigo, BA (Ceylon), PhD (Nottingham)

Associate Professors
G. F. Atkinson, MA, PhD (Toronto), CChem, FRSC (UK), FCIC
L. J. Brubacher, BA (Goshen College, Indiana), PhD (Northwestern)
J. B. Capindale, MA, DPhil (Oxford)
P. C. Chieh, BSc (Nat. Taiwan), MSc (Nat. Tsing Hua), PhD (Br. Col.)
W. L. Elsdon, MSc (W. Ont.), PhD (McGill)
R. J. Friesen, BSc, MSc (Manitoba)
R. J. LeRoy, BSc, MSc (Toronto), PhD (Wisconsin)
J. L. Kuppel, BA, PhD (Toronto), FCIC
D. Mackay, BSc, PhD (Aberdeen)
A. D. Maynes, MA, PhD (Toronto)
G. L. Rempe, BSc, PhD (Br. Col.), FCIC
G. E. Toogood, BSc, PhD (Nottingham)

Assistant Professors
G. I. Dmitrienko, BSc, PhD (Toronto)
M. F. Tchir, BSc (Alberta), PhD (W. Ont.)

Senior Demonstrators
S. O. deSilva, BSc Hons (Ceylon), PhD (Waterloo)
C. Foltzer (Mra.), BSc (Purdue), MSc, PhD (Rutgers)
T. Rudensky, BSc (Waterloo)

Research Assistant Professor
A. J. Thakkar, BSc, PhD (Queen's)

Faculty Members holding cross appointments as shown
\*Chemistry and Physics
\*Chemistry and Applied Mathematics
\*Chemistry and Chemical Engineering

Course Descriptions

General Notes

Prerequisites
Prerequisites must be passed in order to begin any course. A working knowledge of the contents of the prerequisite course will usually be assumed by instructors. Courses equivalent to the named prerequisite may be acceptable. With consent of the instructor, prerequisites may be waived in exceptional cases.

Corequisites
Unless credit has already been obtained for a corequisite or its equivalent, it must be taken in the same term with the course requiring it.

Antirequisites
These are courses with significant overlap. Degree credit cannot be obtained for both the antirequisite and the course naming it.

Students from non-chemistry programmes
In general, it should be assumed that the rules stated apply unless waived by your Undergraduate Officer.
Course Selection
Course selection should be guided by the rules in the Programme section of the Calendar, and by these general rules:
Honours Chemistry Students (all programmes) may not take General Programme courses for degree credit.
Honours Science, Programme 3 Students must take some Honours Core courses but may take General Programme courses for the rest of their degree credits.
General Science, Chemistry Major Students may not take Honours Core courses but must take the General Programme equivalents.
General Science (non-major) Students may not take Honours Core courses. Nor may they take 400-level courses, and certain 300-level courses, without the consent of the instructor.
The following courses have limited accessibility:
(a) by Correspondence only: 344, 360, 361
(b) to Engineering Students only: 26, 36
In all cases, it is the student's responsibility to determine his eligibility to enter a course. It is advisable to obtain such consents in writing before registration period to avoid delays and complications.
Most 300- and 400-level courses are listed as 2 lecture hours. An additional hour may be scheduled at the discretion of the lecturer, usually for a tutorial.

Core Courses
The courses listed below are core courses
(a) for Honours Students only:
   Inorganic: 212, 312, 313, 314L, 315L
   Analytical: 220, 221, 220L, 221L
   Physical: 254, 255, 355, 358, 355L, 358L
   Organic: 264, 265, 364, 365, 368, 265L, 364L, 365L
   Advanced Lab: 492
(b) for General Students (Chemistry Major) or others with the prerequisites:
   Inorganic: 218, 219, 316, 318L
   Analytical: 226, 227, 226L, 227L
   Physical: 356, 357, 356L, 357L
   Organic: 266, 267, 366, 266L, 366L

Courses carrying no university credit.

Chem 001 T 0
Pre-University Chemistry
The course covers the material considered essential preparation for first year chemistry courses. Included are formulae, nomenclature, stoichiometry, an introduction to thermochemistry, solution chemistry, chemical equilibria, acids, bases, oxidation-reduction reactions, kinetics and bonding.
Successful completion of this course fulfills the University Admission requirements where high school chemistry is necessary. No University credit.

Chem 10 F,W,S 1C 0
General Chemistry Seminar
Required for all Chemistry students beyond Year 1, this seminar brings together students from all years to receive information concerning the activities of the Chemistry Department and the Chemical Institute of Canada, and to hear invited speakers.

Year 1 Chemistry Courses

Chem 123 F 3C 0.5
Chemical Reactions, Equilibria and Kinetics
Prereq: Year 5 Chem, Math (Calculus).
Coreq: (for Science students) Chem 123L

Chem 123L F 3L 0.25
Chemical Reaction Laboratory 1
Selected experiments for students taking Chem 123.

Chem 124 W,S 3C 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: Year 5 Chem, Math (Calculus)
Chem 123 strongly recommended
Coreq: (for Science students) Chem 124L

Chem 124L W,S 3L 0.25
Chemical Reaction Laboratory 2
Selected experiments for students taking Chem 124.

Upper Year Chemistry Courses

Chem 26 F,W 3C,3L 0.5
Organic Chemistry 1
The basic chemistry of the important classes of aliphatic and aromatic compounds. A laboratory course on preparative organic chemistry and organic techniques accompanies the lectures.
Prereq: Grade 13 Chem
Antireq: Chem 124
(For students in year 2 Engineering)
Chem 36  F,S  3C  0.5

Organic Chemistry 2
An introduction to the important classes of heterocyclic compounds and natural products.
Prereq: Chem 26
Antireq: Chem 264, 266
(For students in year 2 Engineering)

Chem 212  F  3C  0.5

Structure and Bonding
Prereq: Grade 13 Chem, Phys
Antireq: Chem 218

Chem 218  F  2C,1T  0.5

Development of Chemical Bonding and Structure
Prereq: Grade 13 Chem, Phys
Antireq: Chem 212

Chem 219  W  2C,1T  0.5

Chemistry of Non-Transition Metals
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

Chem 220  F,W  2C,1T  0.5

Introductory Analytical Chemistry
The principles underlying quantitative measurements.
Prereq: Chem 123, 123L
Coreq: (for Science students) Chem 220L
Antireq: Chem 226

Chem 220L  F,W  3L  0.25

Analytical Chemistry Laboratory 1
Selected experiments for students taking Chemistry 220.

Chem 221  W,S  2C  0.5

Analytical Chemistry of Multi-Component Systems
Applications of electroanalytical methods, spectroscopic methods, and analytical separations to the quantitative description of multi-component systems.
Prereq: Chem 220
Coreq: (for Science students) Chem 221L
Antireq: Chem 227

Chem 221L  W,S  6L  0.5

Analytical Chemistry Laboratory 2
Selected experiments for students taking Chemistry 221.

Chem 226  F  2C  0.5

Chemical Analysis 1
A variety of classical and modern analytical methods.
Prereq: Chem 123, 123L
Coreq: (for Science students) Chem 226L
Antireq: Chem 220

Chem 226L  F  3L  0.25

Chemical Analysis Laboratory 1
Selected experiments for students taking Chem 226.

Chem 227  W  2C  0.5

Chemical Analysis 2
The evolution of some modern analytical methods.
Prereq: Chem 226 or 220
Coreq: (for Science students) Chem 227L
Antireq: Chem 221

Chem 227L  W  6L  0.5

Chemical Analysis Laboratory 2
Selected experiments for students taking Chem 227.

Chem 237  W  3C  0.5

Introductory Biochemistry
The basic chemistry of amino acids, peptides, proteins, carbohydrates and lipids including some aspects of metabolism.
Prereq: Chem 266
Antireq: Chem 332

Chem 237L  W  3L  0.25

Introductory Biochemistry Laboratory
Selected experiments for students taking Chem 237.

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 equilibrium.
Prereq: Chem 123, Math 113 or equivalent.
Antireq: Chem 356

Chem 255  F,W,S  2C,1T  0.5

Physical Chemistry 2
Thermodynamic concepts are applied to a variety of systems, to mixtures of nonelectrolytes and to solutions of electrolytes. The difference between thermodynamic and dynamic equilibria is introduced to deal with rates of chemical reactions and their relationship to experimental data.
Prereq: Chem 254
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Type</th>
<th>Title</th>
<th>Description</th>
<th>Prerequisites</th>
<th>Antirequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chem 264</td>
<td>F,W</td>
<td>Organic Chemistry 2</td>
<td>Preparation and reactions of typical organic functional groups examined from the basis of the reaction mechanisms. Introduction to spectroscopic correlations of these functional groups. Stereochemistry of organic molecules.</td>
<td>Prereq: Chem 124</td>
<td>Antireq: Chem 36, 266</td>
</tr>
<tr>
<td>Chem 265</td>
<td>F,W,S</td>
<td>Organic Chemistry 3</td>
<td>The treatment of organic chemistry in terms of reaction mechanisms and spectroscopic correlations is continued and extended to aromatic compounds.</td>
<td>Prereq: Chem 264 taken in or after 1981-82</td>
<td>Antireq: Chem 36, 266</td>
</tr>
<tr>
<td>Chem 265L</td>
<td>F,W,S</td>
<td>Organic Chemistry Laboratory 1</td>
<td>Selected experiments for students taking Chem 265.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chem 266</td>
<td>F</td>
<td>Basic Organic Chemistry 2</td>
<td>The basic chemistry of the important classes of aliphatic and aromatic compounds including aspects of stereochemistry and reaction mechanisms.</td>
<td>Prereq: Chem 124</td>
<td>Antireq: Chem 36, 264</td>
</tr>
<tr>
<td>Chem 266L</td>
<td>F</td>
<td>Organic Chemistry Laboratory</td>
<td>Selected experiments for students taking Chemistry 266.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chem 267</td>
<td>W</td>
<td>Basic Organic Chemistry 3</td>
<td>A continuation of the concepts of Chem 266. Introduction to carbohydrates, proteins, steroids, etc. Introduction to NMR and IR spectroscopies.</td>
<td>Prereq: Chem 266</td>
<td>Antireq: Chem 36, 265, 364</td>
</tr>
<tr>
<td>Chem 312</td>
<td>F,S</td>
<td>Transition Metal Chemistry</td>
<td>The transition elements and their compounds. Stereochemistry of complex ions; ligand field and molecular orbital theories of metal-ligand bonding; electronic spectra and magnetocchemistry of complexes; reaction mechanisms (if time permits).</td>
<td>Prereq: Chem 212</td>
<td>Antireq: Chem 316, 344</td>
</tr>
<tr>
<td>Chem 313</td>
<td>W</td>
<td>The Chemistry of the Main Group Elements</td>
<td>A systematic approach to the syntheses, properties, reactions and structures of main group element compounds. 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.</td>
<td>Prereq: Chem 212</td>
<td>Antireq: Chem 219</td>
</tr>
<tr>
<td>Chem 314L</td>
<td>F,W,S</td>
<td>Inorganic Chemistry Laboratory 1</td>
<td>An introduction to practical inorganic chemistry.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chem 315L</td>
<td>F,W</td>
<td>Inorganic Chemistry Laboratory 2</td>
<td>Advanced experiments in inorganic chemistry.</td>
<td>Prereq: Chem 314L</td>
<td></td>
</tr>
<tr>
<td>Chem 316</td>
<td>F</td>
<td>Coordination Chemistry</td>
<td>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.</td>
<td>Prereq: Chem 218 or 212</td>
<td>Antireq: Chem 312</td>
</tr>
<tr>
<td>Chem 316L</td>
<td>F</td>
<td>Inorganic Chemistry Laboratory</td>
<td>Selected experiments for students taking Chemistry 316.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chem 320</td>
<td>W</td>
<td>Chemical Instrumentation</td>
<td>The principles of operation, practical limitations and preferred uses of various instruments commonly used to make accurate measurements of importance in modern chemistry.</td>
<td>Prereq: Chem 221 or permission of instructor.</td>
<td></td>
</tr>
<tr>
<td>Chem 320L</td>
<td>W</td>
<td>Chemical Instrumentation Laboratory</td>
<td>Selected experiments for students taking Chem 320.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Chem 332L  F,W  3L  0.25
Biochemistry 1 Laboratory
Qualitative and quantitative measurements of biochemically important materials for students taking Chemistry 332.

Chem 333  F,W  2C  0.5
Biochemistry 2
Introduction to the chemistry and metabolism of carbohydrates and lipids.
Prereq: Chem 332, or 237 and 267

Chem 333L  F,W  3L  0.25
Biochemistry 2 Laboratory
A continuation of Chemistry 332L for students taking Chemistry 333.

Chem 344  Y  T  1.0
Inorganic and Nuclear Chemistry
Survey of transition metal chemistry including ligand field theory of co-ordination compounds and an introduction to organometallic chemistry. Introduction to nuclear and radiochemistry.
Prereq: Chem 212 or 218
Antireq: Chem 311 and 312
(By correspondence only.)

Chem 350  W  2C  0.5
Spectroscopy and Molecular Structure
Introduction to concepts and applications of microwave, Raman, IR, electronic and resonance spectroscopy with respect to molecular parameters.
Prereq: Chem 355

Chem 351  W (even years)  2C  0.5
Statistical Thermodynamics
Ensembles, postulates of statistical mechanics; Boltzmann, Fermi-Dirac, and Bose-Einstein statistics; microcanonical, canonical and grand canonical ensembles; equilibrium statistical mechanics and statistical thermodynamics; application to ideal gases.
Prereq: Chem 358. In Years when Chem 351 is not offered, students wishing this material should take Phys 359.

Chem 353  F,S  3C  0.5
Introduction to Polymer Science
Basic definitions and polymer nomenclature, molecular weight averages and distributions, polymer stereoisomerism, step-growth and chain-growth polymerization reactions, applications of polymers.
Prereq: Chem 254 or equivalent

Chem 355  F,W,S  2C,1T  0.5
Physical Chemistry 3
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 and Math 215 or equivalent.
Antireq: Chem 357

Chem 355L  F,W,S  3L  0.25
Physical Chemistry Laboratory 1
Selected experiments for students taking Chemistry 355.

Chem 356  F  2C,1T  0.5
General Physical Chemistry 1
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 and Math 113
Antireq: Chem 254

Chem 356L  F  3L  0.25
General Physical Chemistry Laboratory 1
Selected experiments for students taking Chemistry 356.
(A special section in Winter term will be available for Honours Biol and Chem students only)

Chem 357  W  2C,1T  0.5
General Physical Chemistry 2
An introductory survey of the concepts and principles of quantum mechanics; the application of these principles to the study of atomic and molecular structure and spectra, and to photochemical phenomena. Chemical kinetics.
Prereq: Chem 356
Antireq: Chem 355

Chem 357L  W  3L  0.25
General Physical Chemistry Laboratory 2
Selected experiments for students taking Chemistry 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
Chem 358L  F,W  6L  0.5
Physical Chemistry Laboratory 2
Selected experiments for students taking Chemistry 358.
Prereq: Chem 355L

Chem 359  W (even years only)  2C  0.5
Application of Chemical Thermodynamics
Partial molar quantities; Gibbs chemical potential and non-ideal systems; chemical equilibrium; theory of electrolytes.
Prereq: Chem 255

Note
In years when Chem 359 is not offered, students should consider Ch E 330 or Ch E 510.

Chem 360  F,W,S  T  0.5
Organic Chemistry 3
Stereochemistry of organic compounds; conformational isomers, geometrical (cis-trans) isomers, optical isomers and diastereomers. Introductory carbohydrate chemistry.
Prereq: Chem 264-364 (By correspondence only.)

Chem 361  W,S  T  0.5
Organic Chemistry 4
Acidity and basicity of organic compounds. Formation and reaction of enolate anions with emphasis on their synthetic utility. Cycloaddition reactions.
Prereq: Chem 360 (By correspondence 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 365 or 366

Chem 363  W  2C  0.5
Applied Organic Chemistry
The organic chemistry involved in selected industrial processes will be discussed. Petroleum chemistry, synthesis of dyestuffs, pharmaceuticals, pesticides, organic polymers, etc.
Prereq: Chem 265 or 267

Chem 364  F,W  3C  0.5
Organic Chemistry 2
The treatment of organic chemistry in Chemistry 264 is continued and extended to aromatic compounds.
Prereq: Chem 264
Antireq: Chem 265

Chem 364L  F,W  6L  0.5
Organic Chemistry Laboratory 2
Selected experiments for students taking Chemistry 364.

Chem 365  F,W,S  2C  0.5
Organic Chemistry 3
Stereochemistry and conformational analysis of organic molecules. Acidity and basicity. Formation and reactions of enolate anions with emphasis on their synthetic utility.
Prereq: Chem 264 or 267
Antireq: Chem 366, 368

Chem 366  F  2C  0.5
Structural and Synthetic Organic Chemistry
Stereochemistry of organic molecules; synthesis of selected organic compounds examined in detail with emphasis on cyclo-addition reactions and condensation reactions.
Prereq: Chem 267 or 364
Antireq: Chem 265

Chem 366L  F  3L  0.25
Organic Chemistry Laboratory
Selected experiments for students taking Chemistry 366.

Chem 367  W  2C  0.5
Selected Topics in Organic Chemistry
Some of the following topics will be discussed: natural products, photochemistry, organometallic compounds, carbohydrate.
Prereq: Chem 365 or 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. Stereochemical concepts applied to organic molecules as well as conformational analysis.
Prereq: Chem 265
Antireq: Chem 365, 366

Chem 368L  F,W,S  6L  0.5
Organic Chemistry Laboratory 2
Selected experiments for students taking Chem 368.

Chem 395  W (even 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 or Major programme.
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 (odd years only) 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 417  
**W (even years only) 2C 0.5**  
**Inorganic Cage Compounds**  
The synthesis, structure and reactions of selected groups of important cage compounds such as metal clusters, metalloboranes, boranes and carboranes 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 alkali and alkaline earth metal cations.  
*Prereq: Chem 312 or 316*

Chem 420  
**F 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 ultra-pure materials, trace and micro determinations.  
*Prereq: Chem 221 or permission of instructor*

Chem 421  
**W 2C 0.5**  
**Spectrometric and Chromatographic Analysis**  
Techniques and fundamental principles of chromatography and mass spectrometry as applied to the identification of chemical compounds.  
*Prereq: Chem 320 and 264, or permission of instructor.*  
*Not offered 1981-82*

Chem 422  
**F 2C 0.5**  
**Thermal and Electrical Analytical Methods**  
Techniques and fundamental principles of thermal and electroanalytical methods in current use.  
*Prereq: Chem 221 and Phys 243 or permission of instructor.*

Chem 432  
**F 2C 0.5**  
**Biochemistry 3**  
Kinetics, stereospecificity, structure and function of enzymes, bio-energetics, oxidative phosphorylation.  
*Prereq: Chem 333*

Chem 432L  
**F 3L 0.25**  
**Biochemistry 3 Laboratory**  
Selected experiments for Honours Biology and Chemistry students taking Chemistry 432.

Chem 433  
**W 2C 0.5**  
**Biochemistry 4**  
Chemistry and biosynthesis of porphyrins, Metabolism of amino acids, purines and pyrimidines, Roles of vitamins in biological transformations, Respiration, muscular contraction.  
*Prereq: Chem 432*

Chem 433L  
**W 3L 0.25**  
**Biochemistry 4 Laboratory**  
Selected experiments for Honours Biology and Chemistry students taking Chemistry 433.

Chem 434  
**W 2C 0.5**  
**Applied Biochemistry**  
Chemistry and function of antibiotics, blood coagulation and related topics, Immuno-chemistry, Nutritional aspects of food.  
*Prereq: Chem 333*

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  
**Polymer Properties and Polymerization**  
Copolymerization, emulsion polymerization, ionic and coordinate polymerization, basics of polymerization process selection.  
*Prereq: Chem 353 or equivalent*  

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 255*  

Chem 455  F  3C  0.5  
**Electrochemistry**  
Electrolytic conductance and transport, thermodynamics of electrolytic cells. Reversible and irreversible electrode processes, metallic corrosion; study of selected industrial electrochemical processes.  
*Prereq: Chem 254 or 356*  

Chem 456  W  2C  0.5  
**Catalysis**  
An introduction to heterogeneous catalysis. Examination of the physical manifestations of catalysis and the development of experimental techniques and theoretical methods for the measurement and elucidation of catalytic phenomena.  
*Prereq: Chem 255*  

Chem 457  W  1C,3L  0.5  
**Experimental Aspects of Polymer Science**  
Selected experiments to illustrate polymerization, polymer properties and fabrication processes.  
*Prereq: Chem 353 or equivalent*  

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 or 364*  

Chem 465  W  2C  0.5  
**Special Topics in Organic Chemistry**  
Topics will be selected from photochemistry, organometallics, synthesis, heterocyclics, natural products, molecular rearrangements. (May be taken in third and fourth year as 465A and 465B provided topics are different).  
*Prereq: or coreq: Chem 365 or 368*  

Chem 492  Y  9L  1.5  
**Advanced Laboratory**  
Laboratory work on a senior year research project. See Chem 492 coordinator for descriptive booklet and details.
Department of Civil Engineering

Professor, Chairman of the Department
W. C. Lennox, BASc, MSc (Waterloo), PhD (Lehigh), PEng

Professor, Dean of Engineering
W. A. McLaughlin, PEng (Sask.), MS, PhD (Purdue), PEng

Professor, Associate Chairman Graduate Studies
S. T. Ariaratnam, BASc (Eng.), MSc (London), PhD (Cambridge)

Associate Professor, Associate Chairman, Undergraduate Studies
N. Kouwen, BASc, PhD (Waterloo), PEng

Professors
E. F. P. Burnett, BSc (Capetown), DIC, MS, PhD (London), PEng (on leave of absence)
M. Z. Cola, CSC (Bucharest), PEng
G. J. Farquhar, BASc (Waterloo), PhD (Wisconsin), PEng
G. M. L. Gladwell, BSc, PhD, DSC (London)
R. Green, BSc (Eng) (London), MSc (Queen's), MSc (Waterloo), PhD (Texas), PEng
D. E. Grierson, BASc, MASC, PhD (Waterloo), PEng
R. C. G. Haas, BSc, MSc (Alberta), PhD (Waterloo), PEng
V. K. Hada, BSc (Calcutta), BSc (Eng) (London), MSc (Queen's), MASC, PhD (Waterloo), PEng
B. G. Hutchinson, BE (Sydney), MSc (Queen's), PhD (Waterloo), PEng
H. H. E. Leipholz, Dipl Eng, Dr. Ing, Docent Habil (Stuttgart), PEng. Recipient of the Distinguished Teacher Award
N. C. Lind, MSc (Tech. Univ. of Denmark), PhD (Illinois), PEng
G. M. McNeice, BASc (Waterloo), PhD (London), PEng
J. T. Pindera, Dr of Tech Sciences (Warsaw), Docent Habil (Cracow), PEng
T. Prasad, BSc, MSc (Banaras Hindu Univ.), PhD (Cambridge)
J. Roorda, BASc (Waterloo), PhD (London), PEng
J. Schroeader, BEng, MEng (McMaster), PhD (Waterloo), PEng
A. N. Sherbourne, BSc (London), MS (Lehigh), MA, PhD (Cambridge), PEng

J. Shortreed, BEngSc (W. Ont.), MSc (Queen's), PhD (Northwestern), PEng
K. N. Smith, BASc (Toronto), MASC (Illinois), PhD (Waterloo), PEng
S. I. Solomon, CivHyd Eng (Bucharest), PhD (City Univ., London), PEng
T. H. Topper, BASc (Toronto), PhD (Cambridge), PEng
T. E. Unny, BE (Madras), MTech (Kharagpur), Dr Ing (Dresden), PEng

Associate Professors
R. W. Cockfield, BSc, MSc (Queen's), PhD (Waterloo), PEng
B. LeLievre, BEng (West Australia), MASC, PhD (Waterloo), PEng
E. L. Matyas, BASc (Toronto), DIC, PhD (London), PEng
E. A. McBean, BASc (Br. Col.), SM, PhD (MIT), PEng
R. M. Schuster', BS, MS (North Dakota State), PhD (Iowa State), PEng
J. C. Thompson, BASc (Toronto), MS, PhD (Illinois), PEng
S. Yagar, BASc, MASC (Toronto), PhD (California), PEng

Assistant Professors
F. F. Saccomanno, BSc, MCP (Manitoba), PhD (Toronto)
J. F. Sykes, BASc, MASC, PhD (Waterloo), PEng

Adjunct Professors
P. M. Allen
T. A. . Brookes, BASc (Toronto), LLB (Osgoode Hall), PEng
H. J. Edens, MSc (Deftt), MA Economics (York), PEng
D. A. Godden, BASc (Toronto), LLB (Osgoode Hall), LLM (York)
D. T. McClurkin, Chartered Accountant
N. W. McLeod, BSc (Alberta), MSc (Sask.), ScD (Michigan), PEng
W. R. Petri, DiplEng (Berlin), PEng
D. W. Schnurr, BASc (Toronto), LLB (Osgoode Hall), PEng
O. Stradal, CE, DSc (Prague)

Faculty members holding cross-appointments as shown
Architecture and Civil Engineering
Course Descriptions

Civil Engineering

Civ E 110 W 3C 0.5
Urban Transport Problems and Prospects
Overview of urban development and role played by transport. Dimensions of current issues such as congestion, travel equity, pollution and energy consumption. Transport demands and relation to land use. Transport planning options; transport technology, general development options. Not intended for civil engineering students at any level. Not recommended for first year students.

Civ E 116 W,S 2C,4L/T 0.75
Engineering Concepts 2
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.

Year 1 Engineering

Civ E 200 S,F 2C,3T 0.5
Civil Engineering Project 1
Functional designs of standard civil engineering structures. The creation and evaluation of alternative geometric configurations in accordance with user requirements. Informational content of previous courses is augmented with lectures on typical civil engineering problems and solutions.

Civ E 203 F,W 3C,2T 0.5
Statics
An analytical treatment of static equilibrium of particles and rigid deformable bodies. Distributed forces, centroids and centres of gravity, moments of inertia. Analysis of structures: trusses, forces in beams and cables. Friction.

Civ E 204 F,W 3C,2T 0.5
Dynamics
An introduction to the Kinematics and Kinetics of particles and rigid bodies. Kinematics of particles; Kinetics of particles; Newton’s Second Law; energy and momentum; impulsive motions; systems of particles. Kinematics of rigid bodies; plane motion of rigid bodies; equations of motion; energy and momentum; impulsive motions.

Civ E 205 F,S 3C,2T 0.5
Mechanics of Deformable Solids 1
Introduction of the concepts of stress and strain. Stress-strain relations for linearly elastic materials; Analysis of the response of prismatic members to axial, shearing, flexural and torsional loads; strain energy, failure hypotheses; instability in columns.

Civ E 211 F,W 3C,2T 0.5
Calculus

Civ E 222 F,S 3C,2T 0.5
Differential Equations

Civ E 224 F,W 3C,2T 0.5
Probability and Statistics

Civ E 265 F,W 3C,3L/T 0.5
Structure and Properties of Materials

Civ E 291 1 wk fld lab 0.5
Survey Camp
A one-week course in surveying. Introduction to surveying, length measurements, levelling, transit surveys. Approximate cost to each student $65.

Civ E 292 F,W 3C,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 on taxes.
Civ E 294  F,S  3C,2T  0.5

**Thermal Sciences**

An introductory course in thermal science. Provides an understanding of thermodynamic principles as well as engineering aspects of heat transfer including applications to practical engineering problems.

Civ E 298  F,W  1S  0.0
Civ E 299  S,F  1S  0.0

**Seminar**

The engineer in society. Principles, methods and practice of Civil Engineering. Informal lectures.

Civ E 300  F,W  2C,3T  0.5

**Civil Engineering Project 2**

Projects ranging from feasibility studies to detailed designs by student teams. Each team member is responsible for a definable portion of a project. The work of the individual is integrated with other team members to produce a complete solution described in a report containing all appropriate calculations and schematics. Particular emphasis is placed on the utilization and integration of knowledge acquired in the more specialized courses, augmented with lectures on project administration.

Civ E 303  W,S  3C,2T  0.5

**Structural Analysis 1**


Civ E 304  F,W  3C,2T  0.5

**Structural Analysis 2**


Civ E 306  F,W  3C,2T  0.5

**Mechanics of Deformable Solids 2**

An advanced course in mechanics of solids. Torsion of non-circular sections, hollow section; Warping of cross-sections; Membrane Stresses in shells; bending of flat plates; beams on elastic foundations; buckling of columns, arches, beams and plates.

Civ E 313  W,S  3C,2T  0.5

**Structural Concrete Design 1**


Civ E 342  W,S  3C,2T  0.5

**Transport Engineering 1**


Civ E 343  F,W  3C,2T  0.5

**Transport Engineering 2**

Modes of Transport in Canada. Trends in use. Role of Civil Engineering profession. Highway transport; Railway transport; Air transport; Water pipeline characteristics; Arctic transport; Multi-modal planning studies.

Civ E 344  F,W  3C,2T  0.5

**Urban and Regional Engineering**

Natural system behaviour; Man's impacts on ecosystems; Current environmental issues in Canada; Canadian urban system; Trends in resource consumption and waste production; Population forecasting; Economic forecasting; Urban spatial structure; Regional water management; Sources of water supply; Spatial aspects of network design; impacts of urbanization on hydrological regimes; Interactions with natural systems.

Civ E 353  W,S  3C,3L,1T  0.5

**Soil Mechanics**

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.

Civ E 354  F,W  3C,2T  0.5

**Foundation Engineering**

A course in foundation engineering; earth pressure theories; retaining walls; anchors; shallow and deep foundations; braced trenches and excavations; slope stability.
Civ E 375  F,W  3C,2L/T  0.5
Sanitary Engineering
Introduction to Sanitary engineering. Water quality; Waste disposal; Water and wastewater treatment; physical treatment processes; chemical treatment processes; biological treatment processes; sludge handling; advanced treatment processes.

Civ E 381  W,S  3C,2T  0.5
Hydraulics
Introduction to hydraulics. Dimensional analysis, hydraulic modelling; Turbo machinery, pumps and turbine characteristics; Open channel flow; Reservoir operation; Hydraulic structures; Unsteady flow; Gradually varied flow.

Civ E 383  F,W  3C,2T  0.5
Water Distribution and Collection Systems
Water requirements; water and waste volumes; water storage. Water supply and distribution systems, computer models; Urban hydrology, storm sewers, flood routing; Wastewater collection, sanitary sewers. Hydraulics of treatment works.

Civ E 398  W,S  1S  0.0
Civ E 399  F,W  1S  0.0
Seminar
The engineer in society. Principles, methods and practice of Civil Engineering. Informal lectures.

Civ E 400  W  1C,3T  0.5
Civil Engineering Project 3
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.

Civ E 403  F,S  3C,2T  0.5
Structural Analysis 3
Approximate methods of analysis for a variety of structural forms. Application of approximate techniques to beams, building frames, shear wall structures, plates, buckling and vibration problems. Approximate structural design.

Civ E 404  W  3C,2T  0.5
Structural Analysis 4
Matrix and computer methods of structural analysis. Application of the force and displacement methods of analysis to space frameworks, nonlinear structures and continuum discretized into finite elements.

Civ E 405  W  3C,2T  0.5
Structural Dynamics and Stability
Dynamics of discretized structures. Free and forced vibrations of single and multidegree of freedom systems. Impact. Flexural vibrations of beams and plates. Static and dynamic instability of beams, shafts and frames.

Civ E 413  F,S  3C,2T  0.5
Structural Steel Design

Civ E 414  F,S  3C,2T  0.5
Structural Concrete Design 2
Sectional design principles; Element and member design; Prestressed concrete elements; Slab systems; Building systems; Elements of bridge design.

Civ E 415  W  3C,2T  0.5
Structural Systems

Civ E 430  W  3C,3L  0.5
Experimental Mechanics
Principles and techniques of experimental determination of responses of engineering structures to mechanical, thermal and wind loads, in real and simulated conditions. Foundations of modelling, observations and measurements. Selected experimental techniques: strain gauges, photo-elasticity, holography, dynamic techniques, thermoelasticity, moire.

Civ E 440  F,S  3C,2T  0.5
Urban Traffic Management

Civ E 442  W  3C,2T  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 444 W 3C,2T 0.5
**Urban Transport Planning**
Application of concepts of CE 342, 343, 344 to typical urban transportation planning situations. Urban transit, a regional shopping activity centre, a major housing development considered using case studies. Methods of earlier courses linked to typical real life problems.

Civ E 453 F,S 3C,2T 0.5
**Engineering Geology**
A course in engineering geology; engineering properties and characteristics of typical landforms, soils, rocks, and ground water regimes; introduction to earthquake resistant design and air-photo interpretation.

Civ E 454 W 5T 0.5
**Geotechnical Engineering**
This course simulates geotechnical consulting practice. Students are exposed to real situations which require problem identification, evaluation of geotechnical data, analysis, design and report preparation.

Civ E 472 F,S 3C,2T 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 3C,2T 0.5
**Pollution in the Aquatic Environment**

Civ E 480 W 3C,2T 0.5
**Basic Principles of Water Resources**

Civ E 486 F,S 3C,2T 0.5
**Hydrology**
An introduction to hydrology, the hydrologic cycle; Runoff phenomena; River basin characteristics; Statistical and probability analysis of hydrologic data; Time series analysis; Non-stationary aspects of hydrology; Forecasting.

Civ E 491 W 3C,2T 0.5
**Engineering Law**

Civ E 493 W 4C 0.5
**Engineering in the Canadian North**
Introduction to the technical, ecological and sociological problems associated with construction in the Canadian North. Major topic areas are transportation, water supply, foundations and structures. Specific topics include engineering and feasibility studies for railways, pipelines, natural resource explorations, vehicle development and marine anchorages.

Civ E 496 F,S 3C,2T 0.5
**Project Management**

Civ 498/499 S,F,W 1S/S 0.0/0.0
**Seminar**
The engineer in society. Principles, methods and practice of Civil Engineering. Informal lectures.
Department of Classical Studies

Associate Professor and Chairman of the Department
P. Forsyth, AB (Mount Holyoke), MA, PhD (Toronto)
Recipient of the Distinguished Teacher Award

Professors
P. Keresztes, MA (Toronto), PhD (Graz)
D. C. Mackenzie, BA, MA, PhD (Princeton)

Assistant Professors
S. B. P. Haag, BA, MA (Queen's), MA (Waterloo) MPhil (Toronto)
R. L. Porter, BA (McMaster), MA, PhD (Princeton)

Lecturer (Part time)
D. W. Baronowski, BA (McGill), MA (Br. Col.)

Adjunct Faculty at Wilfrid Laurier University
H. A. MacLean, BA (McMaster), MA, PhD (Wisconsin)
D. W. Roller, BA, MA (Oklahoma), PhD (Harvard)
G. P. Schaus, BA, MA (Dalhousie), PhD (Pennsylvania)
J. Zeyl, BA, MA (Toronto), PhD (McMaster)

Course Descriptions

Classical Civilization (Courses in Translation)

C Civ 101 F 3C 0.5
Colossos - The Major Figures of Ancient Greece
An introductory study of the achievement of ancient Greece through some of its most prominent figures. Each year two of the following will be featured: Theseus: The Minoan-Mycenaean Age of Bronze; Pericles and the Rise of Democracy; Socrates, Man and Martyr; Alexander the Great and The Age of Expansion.

C Civ 102 W 3C 0.5
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.

C Civ 201 F 3C 0.5
Ancient Greek Society
A survey of the civilization of Classical Greece, featuring such topics as the individual (male and female), political institutions, art, religion, philosophy, literature, social life and leisure activities.

C Civ 202 S.W 3C 0.5
Ancient Roman Society
A survey of the civilization of the Roman Republic and Empire, featuring such topics as the individual (male and female), political institutions, art, religion, philosophy, literature, social life and leisure activities.

C Civ 251 F 3C 0.5
Greek History
A survey of ancient Greece, emphasizing its political, military, social and economic aspects.
This course is acceptable for credit by the History Dept.

C Civ 252 W 3C 0.5
Roman History
A military, political, social, economic survey of Rome from earliest times to the Empire's fall.
This course is acceptable for credit by the History Dept.

Note
Classical Studies accepts History 237/238 as term courses for Classical Civilization credit. But a student may not take both History 237/238 and C Civ 251/252.

C Civ 255
Medieval Civilization
Not offered 1981/82.

C Civ 256 Medieval Civilization
Not offered 1981-82.

C Civ 265 F 3C 0.5
Classical Verse in Translation 1
Greek and Roman Epic and Early Tragedy: a study of the evolution of ancient epic from Homer to Vergil. The beginnings of the art of tragic drama will be studied through the plays of Aeschylus.

C Civ 266 W 3C 0.5
Classical Verse in Translation 2
Tragedy and Comedy: a study of Classical Greek tragic drama, featuring the plays of Sophocles and Euripides. The art of Greek comedy will be examined through the plays of Aristophanes. Roman dramatic art will be studied through the plays of Seneca and Plautus. (Same as Drama 251)

Note
Drama majors in this course will normally be required to do additional work on Aeschylus.
Classical Studies

Greek

C Civ 283  F  3C  0.5
History of Ancient Philosophy 1
From the beginnings to Plato.
(Same as Phil 280)

C Civ 284  W  3C  0.5
History of Ancient Philosophy 2
From Aristotle to the close of classical antiquity.
(Same as Phil 281)

C Civ 301  F  3C  0.5
Ancient Myth and Religion 1
A study of Greek and Roman myth, including the
birth of the gods, creation, the Olympians,
Prometheus and the fall, the flood, the ages of man.

C Civ 302  S  3C  0.5
Ancient Myth and Religion 2
A study of Greek and Roman legend, including the
cycles of Troy, Mycenae, Thebes; the Argonauts, the
heroes, Odysseus; and of the mystery religions (with
their relation to Christianity).

C Civ 351  F,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.
(Same as Fine Arts 310.)

C Civ 352  F,W  3C  0.5
Roman Art and Architecture
A survey of the art and architecture of the Roman
world from Etruscan to Imperial times.

C Civ 366  W  3C  0.5
Ancient Lyric and Satire in Translation
Lyric poetry of Greece and Rome, including Sappho,
Pindar, Catullus, Horace and others; classical satire,
including Horace, Petronius, Juvenal, Lucian.
Prereq: C Civ 265 or 266, or an appropriate course in
literature, or instructor's permission.

C Civ 371  F  3C  0.5
Christianity and the Roman Empire 1
The relationship between Christianity and the
Roman Empire from the beginning to 200 A.D.,
including the trial of Christ, the trials of Paul, the
burning of Rome in 64 A.D., and the subsequent
outlawing of Christianity.

C Civ 372  S  3C  0.5
Christianity and the Roman Empire 2
Not offered 1981-82

C Civ 381 From Diocletian to Constantine
Not offered 1981-82.

C Civ 382  F  3C  0.5
Constantine the Great
A study of Constantine's rise to power as sole ruler
of the Roman Empire, his measures to secure the
economy, his relationship with the
Christian Church, and the establishment of 'New
Rome'.

C Civ 384  S  3C  0.5
Science and Technology of Ancient Greece and
Rome
A study of scientific thought and achievements in
such areas as astronomy, biology, anatomy and
medicine, and of the technological skills which
produced and distributed raw materials,
manufactured goods and agricultural products.
Prereq: First year science or engineering course, or
C Civ 201 or 202 or 251 or 252 or instructor's
permission.

C Civ 401 Atlantis: The Making of Myth
Not offered 1981-82.

C Civ 480  Y  2S  1.0
Greek Civilization and History
Senior seminar. An intensive study of various
problems and aspects of Greek Civilization and
History.
Prereq: C Civ 201 or C Civ 251 or C Civ 351 or
instructor's permission.
This course is acceptable for credit by the History
Department.

C Civ 490 Roman Civilization and History
Not offered 1981-82.

C Civ 492-498
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.

Greek

Grk 100  Y  3C  1.0
Introductory Ancient Greek
A course designed for students beginning the study
of ancient Greek or who have not yet reached the
level expected in Greek 251. The aim is to attain as
rapidly as possible the ability to read simple prose.
The emphasis is on forms and structure; reading of
connected passages will begin early in the first term.
Course Descriptions

Greek

Grk 251  F  3C  0.5
Greek Composition and Grammar
Translation, composition and review of basic grammar, with intensive analysis of selected works. Offered 1981-82 at Wilfrid Laurier University.

Grk 252 Introduction to Homer
Not offered 1981-82.

Grk 261 W  3C  0.5
Introduction to Attic Prose
Selections from the works of Plato. Offered 1981-82 at Wilfrid Laurier University.

Grk 271 Hellenistic and Later Greek Literature
Not offered 1981-82.

Grk 351 Advanced Composition and Grammar
Not offered 1981-82.

Grk 361 The Drama of Euripides
Not offered 1981-82.

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. 
Prereq: One full 200 level Greek course or instructor's permission.

Grk 371 Introduction to the Greek Historians
Not offered 1981-82.

Grk 372 Herodotus
Not offered 1981-82.

Grk 452 Homer
Not offered 1981-82.

Grk 461 The Drama of Aeschylus
Not offered 1981-82.

Grk 462 W  2S  0.5
The Comedy of Aristophanes
An examination of the dramatic art of Aristophanes by translation of at least one play and the reading of others in translation.

Grk 471 F  2S  0.5
Thucydides
Detailed study of the Peloponnesian War.

Grk 481 F  2S  0.5
The Philosophy of Plato
Detailed study of the Republic. Offered 1981-82 at Wilfrid Laurier University.

Grk 482 W  2S  0.5
The Philosophy of Aristotle
Detailed study of the major works. Offered 1981-82 at Wilfrid Laurier University.

Grk 490-499 0.5
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.

Note
Senior standing or instructor's permission is prerequisite for any 400 level Greek course.

Latin

Lat 100 Y  3C  1.0
Introductory Latin
A course designed for students beginning the study of Latin or who have not yet reached the level expected in Lat 151/152. The aim is to attain as rapidly as possible the ability to read simple prose. The emphasis is on forms and structure: reading of connected passages will begin early in the first term.

Lat 151 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. 
Prereq: Grade 13 Latin, Lat 100; or consent of instructor.

Lat 152 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 151. 
Prereq: Lat 151; or consent of instructor.

Lat 251 Latin Composition and Grammar
Not offered 1981-82.

Lat 261 F  3C  0.5
Latin Prose 1
Selections from the Letters of Cicero and Pliny.

Lat 262 Latin Prose 2
Not offered 1981-82.

Lat 272 An Introduction to Vergil
Not offered 1981-82.
Lat 281  W  3C  0.5
Latin Poetry 1
Selections from the lyric poems of Catullus and Horace.
Offered 1981-82 at Wilfrid Laurier University.

Lat 282 Latin Poetry 2
Not offered 1981-82.

Lat 352  F  3C  0.5
The History of the Latin Language
A study of the history and development of the Latin language from its origins to its evolution into the Romance languages.
Offered 1981-82 at Wilfrid Laurier University.

Lat 361  F  3C  0.5
Cicero
The life and works of Cicero, his historical importance and his contribution to Latin literature. Selections from various works.

Lat 362 Lucretius
Not offered 1981-82.

Lat 363  W  3C  0.5
Roman Comedy
The study in Latin of at least one play by Plautus or Terence; supplementary readings in translation.
Offered 1981-82 at Wilfrid Laurier University.

Lat 371 An Introduction to the Roman Historians
Not offered 1981-82.

Lat 372 Tacitus
Not offered 1981-82.

Lat 381 Medieval Latin 1
Not offered 1981-82.

Lat 382 Medieval Latin 2
Not offered 1981-82.

Lat 461  W  2S  0.5
Vergil 1
Aeneid I-VI (selections).

Lat 462 Vergil 2
Not offered 1981-82

Lat 471 Roman Elegy
Not offered 1981-82.

Lat 481  F  2S  0.5
Roman Satire 1
Selections from Horace and Persius.

Lat 482  W  2S  0.5
Roman Satire 2
Selections from Petronius, Martial, and Juvenal.
Offered 1981-82 at Wilfrid Laurier University.

Lat 491-494  0.5
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.

Note
Senior standing or instructor's permission is prerequisite for any 400 level Latin course.
### Dance Group

Assistant Professor, Chairman of Dance Group  
R. Priddle, BPHE (Toronto), MSc (Springfield),  
MA (Waterloo), PhD (Waterloo)

Dean, Faculty of Human Kinetics and Leisure Studies  
G. S. Kenyon, BPE (Br. Col.), MS (Indiana), PhD (NYU)

Assistant Professor and Undergraduate Officer  
J. Officer, ARAD (Adv. and ATC) (London)  
Recipient of the Distinguished Teacher Award.

Assistant Professor  
R. Ryman, BA (York), MA (York)

Lecturers  
D. Taplin, BA (Bennington), MFA (York)  
N. De Shane-Gill, BA (York), MA (York)

Instructors  
D. Leslie  
G. Miceli, BSc, (Waterloo)  
L. McKillop, BSc (Waterloo)

### Course Descriptions

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
</table>
| Dance 110 F | 2C,2T 0.5 | Introduction to the World of Dance  
A survey of the evolution of dance as both ritual and art and of the capacities of the discipline today.  
Extensive viewing of films and live performances in addition to lectures. This is not a studio course. |
| Dance 111 W | 2C,2std 0.5 | The Elements of Dance  
Discussion and experience in the material, content and form of a work of art. Studio. Problem solving in space, dynamics and rhythm.  
Prereq: Dance 110 or consent of instructor |
| Dance 220 W | 3C 0.5 | Socio-cultural Study of Western Dance  
Development and significance of dance as a social phenomenon in Western Society.  
Prereq: Soc 101  
Offered alternate years |
| Dance 221 W | 3C 0.5 | Socio-cultural Study of Non-Western Dance  
Development and significance of dance as a social phenomenon in non-Western Society.  
Prereq: Soc 101 or Anth 102A  
Offered alternate years |
| Dance 225 W | 2C,2std 0.5 | Dance Ethnology  
Study of works of art in non-Western cultures, i.e. India, Japan, China, Africa.  
Prereq: Anth 102A or consent of instructor  
Offered alternate years |
| Dance 230 F | 2C,2std 0.5 | Roots of Western Theatrical Dance  
History and cultural significance of dance up to and including Fokine and Duncan.  
Prereq. for Dance students: Hist 105 or consent of instructor. |
| Dance 231 W | 3C 0.5 | History of Ballet in the Twentieth Century  
A study of the factors affecting the Ballet in the 20th century from the advent of the Russasian in Paris in 1909 to the influence of contemporary dance in recent years.  
Prereq: Dance 230  
Offered alternate years. |
| Dance 233 W | 3C 0.5 | A History of Modern Dance  
This course examines the major choreographic innovators who have philosophically and stylistically shaped the Modern dance idiom.  
Prereq: Dance 230  
Offered alternate years.  
Not offered 1980-81. |
| Dance 241 Benesh Notation 1 | 3C | Not offered Fall, 1981. |
| Dance 242 F | 3C 0.5 | Labanotation 1  
A theoretical and practical introduction to Labanotation.  
Prereq: 2 courses in dance technique or consent of the instructor.  
Offered alternate years. |
| Dance 336 F | 3C 0.5 | Philosophy and Criticism of Dance 1 Part 1  
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 337 W | 3C 0.5 | Philosophy and Criticism Part 2  
This course examines the writings of various philosophers on the subject of dance; various aesthetic theories and their application to dance; and aesthetic issues that arise in dance specifically.  
Prereq: consent of instructor.  
Offered alternate years. |
Dance 341 Benesh Notation 2
Not offered Winter, 1982.

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 346 W 3C 0.5
Applied Movement Analysis (Part 1)
Applied anatomy for the dancer. Topics covered include posture, balance, leg extensions and torso and arm placement.
Prereq: Kin 200, 4 courses in dance technique or consent of the instructor.
Offered alternate years.

Dance 347 Applied Movement Analysis (Part 2)
Not offered Winter, 1982.

Dance 351 W 2C,2std 0.5
Ballet Choreography
Analysis and study of themes and styles of the 20th century ballets. Through film and studio experience, consideration is given to the adaptations of the classical idiom to the artistic trends of this century.
Prereq: Dance 111, 231 and 392.
Offered alternate years.

Dance 353 Modern Dance Composition
Not offered Winter, 1982.

Dance 364 Developmental Aspects of Movement
A study integrating the theoretical and applied aspects of motor and perceptual-motor development in children and adolescents. Tutorials include working with children in a physical activity setting.
Not offered Fall, 1981
Offered Fall, 1982

Dance 410/411
Research Project
An independent research project on an approved topic, supervised by a faculty member. Required of all students enrolled in Honours Dance.
Dance 410 includes an approved design and the completion of the first segment of the paper.
Prereq: depending upon the topic selected, the student is required to achieve at least 60% in appropriate courses. A complete listing is available in the departmental office. Dance 411 includes the completion of the project begun in Dance 410.
Prereq: Dance 410

Dance 412 W 3C 0.5
Seminar in Dance
An examination of current and major issues in dance.
Prereq: Honours Dance students only.

Dance 474 F,W 0.5
Directed Study on Special Topics
For the student who wishes to pursue a particular topic in depth through guided independent research and/or reading. A faculty member must approve a student’s project prior to registration. This course may be repeated in subsequent terms.
Prereq: Consent of faculty.

Dance 480 F,W wkshp 0.5
Workshop Series
The following courses are designed to give the student an opportunity to take theoretical knowledges to the applied setting. Offerings each year are determined by student interests. Topics available include:

Dance 480 Court Dance
Dance 481 Ballet Choreography
Dance 482 Dance Notation Reconstruction
Dance 483 Modern Dance Composition
Dance 484 Dance with Children
Dance 485 Dance with Adolescents and Adults
Dance 486 Dance Production

The workshop series is open only to 3rd and 4th year Honours Dance students. Two workshops may be taken in the 480 series toward the Honours degrees. Prereq: Permission of instructor.

Technique Courses 0.25
Each of the following technique courses consists of two classes per week for one term. Students should consult with a faculty advisor concerning the applicability of these courses for entry into future courses and possible careers such as teaching.
Students entering technique courses with previous dance training may be eligible for placement in upper level courses. Admission by audition. Auditions held in April and September. Consult the Dance Department for exact date and location.
Ballet “A” Division: For students with background training equivalent to pre-elementary in one of the formalized systems:
- Dance 191A Elementary Ballet I F
- Dance 192A Elementary Ballet II W
- Dance 291A Intermediate Ballet I F
- Dance 292A Intermediate Ballet II W
- Dance 391A Advanced Ballet I F
- Dance 392A Advanced Ballet II W

Ballet “B” Division: For students with limited or no previous training:
- Dance 191B Basic Ballet I F
- Dance 192B Basic Ballet II W
- Dance 291B Basic Ballet III F
- Dance 292B Basic Ballet IV W
- Dance 391B Pre-elementary Ballet I F
- Dance 392B Pre-elementary Ballet II W

Modern Dance “A” Division: A sequence of courses focusing on the Graham Technique:
- Dance 193A Pre-Graham I F
- Dance 194A Pre-Graham II W
- Dance 293A Basic Graham I F
- Dance 294A Basic Graham II W
- Dance 393A Elementary Graham I F
- Dance 394A Elementary Graham II W

Modern Dance “B” Division: A sequence of courses focusing on the Cunningham Technique:
- Dance 193B Pre-Cunningham I F
- Dance 194B Pre-Cunningham II W
- Dance 293B Basic Cunningham I F
- Dance 294B Basic Cunningham II W
- Dance 393B Elementary Cunningham I F
- Dance 394B Elementary Cunningham II W

Folk-Ethnic Dance: A sequence of courses progressing from simple to more complex forms:
- Dance 197 Basic Folk Dance I F
- Dance 297 Intermediate Folk Dance II W
- Dance 397 Intermediate Folk Dance III F
- Dance 497 Character Dance W

Jazz Dance: A sequence of courses in jazz:
- Dance 198 Beginner Jazz F, W
- Dance 298 Elementary Jazz F, W
- Dance 398 Intermediate Jazz F
- Dance 498 Advanced Jazz W

---

Course Descriptions

Dance

Drama and Theatre Arts

---

Drama and Theatre Arts Group

Associate Professor, Chairman
W. R. Chadwick, BA, MA (Toronto), PhD (London)

Assistant Professor
M. van Dijk, BA, MA (Wellington), PhD (Toronto)

Lecturers
J. M. Kelman, BA (Waterloo)

Course Descriptions

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 the historical contexts (from the Greeks to Shakespeare). 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. Historical period covered from Shakespeare to the present.

Prereq: Drama 101A.

Drama 102 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.

Limited Enrolment

Prereq: Drama 101A and B and permission of the department.

Drama 221 F 4L 0.5

Intermediate Acting 1
An extension of Drama 102. This course stresses development of the actor through scene study.

Prereq: Permission of the instructor.
Drama 222  W  4L  0.5  
Intermediate Acting
An extension of Drama 221.  
Prereq: Permission of the instructor.

Drama 226  Seminar in Voice & Movement 1  
Not offered 1981-82.

Drama 227  Seminar in Voice & Movement 2  
Not offered 1981-82.

Drama 231  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 101A and B.

Drama 232  W  3LD  0.5  
Design for the Theatre 2
An extension of the studies described in Drama 231, concentrating on the practicalities of set design.  
Prereq: Drama 101A and B and Drama 243 or consent of the instructor.

Drama 243  F  1C,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  1C,2L  0.5  
Introduction to Technical Production 2
An extension of the studies described in Drama 243.  
Prereq: Drama 101A and B.

Drama 251  F  3C  0.5  
Survey of Dramatic Literature and Dramatic Theory 1  
(cross-listed with C Civ 266)
The Greek and Roman periods.

Note
The above course and the next four courses divide the dramatic literature and theory of the Western world into five historical periods. Each course will cover about fifteen plays and the major works of dramatic theory of the period.

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, the comedy of manners tradition through to the twentieth century.  
(Cross-listed with Engl 233)

Drama 254  3C  0.5  
Survey of Dramatic Literature and Theory 4
The eighteenth, nineteenth and early twentieth centuries, romanticism and naturalism.

Drama 255  3C  0.5  
Survey of Dramatic Literature and Theory 5
The twentieth century from Brecht to the present.

Drama 258  Masterpieces of Western Drama.  
A Study of Performance 1.  
Not offered 1981-82.

Drama 259  Masterpieces of Western Drama.  
A Study of Performance 2.  
Not offered 1981-82.

Drama 261  F  4C,L  0.5  
Introduction to Directing 1
Analysis of production and performance problems from the director's point of view. Study in the principles of stage direction. Special projects in directing, including the production of a workshop production.  
Prereq: Drama 101, one dramatic literature class and permission.

Drama 262  W  4C,L  0.5  
Introduction to Directing 2
Consideration of problems involved in the directing of a production. Each student in the course will be required to form his or her own production company and mount a play.  
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.  
Prereq: Drama 101A and B and two dramatic literature classes.

Drama 302  W  3C  0.5  
Script Interpretation 2
An extension of the studies described above in 301.  
Prereq: Drama 101A and B and at least two dramatic literature classes.
Drama 306 (ABC)   F std  0.5
**Special Studies in Theatre Production 1**
Production participation and the study of selected problems of theatrical production.
*Prereq: Permission of the play director.*

Drama 307 (ABC)   W std  0.5
**Special Studies in Theatre Production 2**
See Drama 306.
*Prereq: Permission of the play director.*

Drama 321   F  4L  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 and Drama 222.*

Drama 322   W  4L  0.5
**Advanced Acting 2**
An extension of the studies described in Drama 321.
*Prereq: Drama 321 or permission.*

Drama 326A   F  5L  0.5
**Seminar in Voice**
A continuation of Drama 226/227
*Prereq: Drama 226/227.*

Drama 326B   F  5L  0.5
**Seminar in Movement**
A continuation of Drama 226/227
*Prereq: Drama 226/227.*

Drama 327A   W  5L  0.5
**Seminar in Voice**
A continuation of Drama 226/227
*Prereq: Drama 226/227.*

Drama 327B   W  5L  0.5
**Seminar in Movement**
A continuation of Drama 226/227
*Prereq: Drama 226/227.*

Drama 343   F  2L,2C  0.5
**Theatre Technology 1**
Advanced study of theory and practice of specific areas of technology in the theatre.
*Prereq: Drama 243 and Drama 244.*

Drama 344   W  2C,2L  0.5
**Theatre Technology 2**
See Drama 343
*Prereq: Drama 243 and Drama 244.*

Drama 348   Arts Administration 1
Not offered 1981-82.

Drama 349   Arts Administration 2
*Not offered 1981-82.*

Drama 351   0.5
**Canadian Drama**
A study of plays by such dramatists as Merrill Denison, Robertson Davies, Gratien Gelinas (in translation), James Reaney, John Coulter, George Ryga and Michael Tremblay (in translation). Background for 20th-century drama will be provided in lectures.
*(Cross-listed with English 316.)*

Drama 361   F std  0.5
**Advanced Directing 1**
Each student in the course will be required to form his or her own production company and mount a play.
*Prereq: Drama 261, 262 and at least three dramatic literature classes and permission.*

Drama 362   W std  0.5
**Advanced Directing 2**
An extension of the studies described in Drama 361.
*Prereq: Drama 361 and at least four dramatic literature classes.*

Drama 371   F  3C  0.5
**Theatre History 1**
A survey of theatre history from Classical Greece to 1600. Students are advised to take this course in their third year.
*Prereq: Drama 101A and B.*

Drama 372   W  3C  0.5
**Theatre History 2**
An extension of studies described in Drama 371.
*Prereq: Drama 101A and B.*

Drama 406 (ABC)   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 (ABC)   W std  0.5
**Theatre Workshop 2**
Participation in stage production for advanced students.
*Prereq: Permission of play director and Drama 101A and B.*

Drama 409   F  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 190 (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 491 (A-E) W wkshp 0.5
Selected Seminars in Drama and Theatre Arts
Seminars in special areas of drama and theatre.
Prereq: Permission of the department.

Drama 499 Y T 1.0
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.

Department of Earth Sciences

Professor, Chairman of the Department
C. R. Barnes, BSc (Birmingham), PhD (Ottawa)

Professor, President of the University
B. C. Matthews, BSA (Toronto), AM (Missouri),
PhD (Cornell), DU (Sherbrooke)

Professor, Dean of Science
R. N. Farvolden, MSc (Alberta), PhD (Illinois)

Professors
J. A. Cherry, BE (Sask.), MS (Cal., Berkeley),
PhD (Illinois), PEng
P. Fritz, Dipl Geol, Dr. rer. nat. (Stuttgart)
P. F. Karrow, BSc (Queen's), PhD (Illinois)
R. W. Macqueen, BA, MA (Toronto), PhD (Princeton)

Associate Professors
E. C. Appleyard, BSc (W. Ont.), MSc (Queen's),
PhD (Cambridge)
E. O. Frind, BSc, MASc, PhD (Toronto), PEng
J. E. Gale, BA, BSc (Memorial), MSc (W. Ont.),
MEngSc, PhD (Cal., Berkeley), PEng
J. P. Greenhouse, BSc, MSc (Br. Col.), PhD (California)
D. E. Lawson, BSc, MSc (New Br), PhD (Reading)
A. V. Morgan², BSc (Leicester), MSc (Calgary),
PhD (Birmingham)
E. J. Reardon, BSc (St. Francis Xavier), PhD (Penn. State)
R. G. Roberts, BA (Cambridge), MSc, PhD (McGill)

Assistant Professors
J. F. Barker, BSc, MSc (McMaster), PhD (Waterloo)
P. Fransham, BSc (Sir G Wms), MSc, PhD (McGill)
R. W. Gillham, BSA (Toronto), MSc (Guelph),
PhD (Illinois)
J. A. Legault, BSc, MSc (Ottawa), PhD (Oklahoma)

Research Professor
I. L. Gibson, BSc, PhD (Imp. College, London)

Adjunct Professors
M. E. Brookfield, PhD (Reading)
R. M. Brown, BSc (Bishops), PhD (McGill)
D. Lee, BSc, MSc (N. Dak.), PhD (Virg. Polytech. Inst.)
I. P. Martini, PhD (McMaster)
F. A. Prantl, BSc, MSc, PhD (Innsbruck)
V. K. Prest, BSc, MSc (Manitoba), PhD (Toronto)
H. C. Saunders, BA (Queen’s Belfast), MA, PhD
(Toronto)
R. L. Thomas, BSc, PhD (Wales)
O. L. White, BSc, MASc (Toronto), PhD (Illinois), PEng

Senior Demonstrator
J. L. Lang, BSc, MBA (Queen’s)
P. McCauley, BSc, MSc (Laurentian)
Faculty members holding cross-appointments as shown
1Earth Sciences and Biology
2Earth Sciences and Man-Environment Studies

Course Descriptions

Details of the undergraduate programmes offered by the Faculty of Science are to be found in Chapter 14.

Earth 121-122 or the consent of the instructor is a prerequisite for all later courses in Earth Sciences. Second and third year courses usually involve field trips in the fall. All those majoring in Earth Sciences are required to take a two-week field camp at the end of the third year and attend a week-long field excursion at the start of fourth year (Earth 390 and Earth 440). The cost will range from $50 to $100 per student for each course. Earth Sciences students are encouraged to seek geological employment in the summers.

Earth 121 F 2C,3L 0.5
Introduction 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
Introduction 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 2C,3L 0.5
Geochemistry 1
Prereq: Earth 121-122 and Earth 231

Earth 231 F 2C,3L 0.5
Mineralogy and Crystallography
Prereq: Earth 121-122.

Earth 232 W,S 2C,3L 0.5
Petrography
Optical properties and identification of minerals under the microscope. 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 260 W,S 2C,3L 0.5
Introductory Structural Geology
Prereq: Earth 121-122

Earth 331 F 2C,3L 0.5
Igneous Petrology
The principles and theories of igneous rock genesis. Silicate phase equilibria in magmatic systems. Magmatic differentiation; distribution and occurrence of magma types.
Prereq: Earth 231, 232

Earth 332 W 2C,3L 0.5
Metamorphic Petrology
Prereq: Earth 231, 232

Earth 333 W 2C,3L 0.5
Introductory Sedimentology
The origin, transport and deposition of sediments. Size analysis and sedimentary structures. Recent sedimentary environments as a key to the interpretation of ancient sediments. Sedimentary petrology.
Prereq: Earth 232
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 236*

Earth 338  W  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. Problem sets will be assigned.  
*Prereq: A course in Statics and Mechanics of deformable materials, or consent of instructor*

Earth 342  F  2C,3L  0.5  
**Geomorphology**  

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 rock 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 113 and an introductory course in computer programming.*

Earth 360  F  3C,2L  0.5  
**Applied Geophysics 1**  
An introduction to seismic, gravity, electric, electromagnetic and magnetic methods of exploration geophysics.  
*Prereq: Physics 111-112 or consent of instructor*

Earth 368  F  2C  0.5  
**Geophysics 1 (identical to Phys 368)**  
*Prereq: Math 113, Phys 121-122 or equivalent*

Earth 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 circulation. Coriolis effects. Some idealized current regimes.  
*Prereq: Math 113 and Phys 121-122 or equivalent*

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  Fieldlab  
**Field Camp**  
Ten day field camp at Whitefish Falls, held at beginning of spring term.

Earth 421  W  2C,3L  0.5  
**Geochemistry 2**  
An introduction to geochemical processes in the low temperature environment with special emphasis on aqueous geochemistry. The laboratory is analytically orientated and familiarizes students with techniques used in geochemical investigations.  
*Prereq: First year chem., Earth 221*

Earth 427  W  2C,3S  0.5  
**Crustal Evolution**  
An analytical critique of the plate tectonics theory, its historical development, the evidence on which it is based, past and present criticisms. Tectonic syntheses based on the theory in the light of world geology.  
*Normally restricted to fourth year Earth Sciences students.*

Earth 432  W  2C,3L  0.5  
**Precambrian Geology**  
The geology, tectonics, stratigraphy and history of the Canadian Precambrian Shield. The early evolution of the earth’s crust. The Precambrian time scale and problems of geochronology. Life, climate and physical conditions in Precambrian time.

Earth 433  W  2C,3L  0.5  
**Applied Sedimentology**  
The source, migration and sedimentary environment of hydrocarbons, exploration, types of traps, extraction. Carbonate sediments and their diagenesis. The environmental impact and control of recent sedimentation.  
*Prereq: Earth 333*
Earth 434  F  2C,3S  0.5
Biostratigraphy
Methods of using paleontological data to solve stratigraphic problems. Faunal provinces in space and time. Effects of continental drift and climatic change on biogeography through the Phanerozoic.
Prereq: Earth 236

Earth 435  W  3C,2L  0.5
Advanced Structural Geology
The geometry, kinematics and dynamics of structural geology. The relationship of structures from the microscopic to the megascopic scale; statistical studies of structural elements.
Prereq: Earth 260

Earth 436  Y  5L  1.0
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 438  F  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 the use in selected engineering geologic design and construction problems. Laboratory assignments will focus on the determination of physical properties and site assessment problems.

Earth 439  F,S  3C,1T  0.5
Hydrogeology
The location, exploitation, and conservation of groundwater. Groundwater-surface water interactions, effect of man's activities on groundwater quality, hydrogeologic aspects of subsurface waste disposal.

Earth 440  F  2C,3L  0.5
Quaternary Geology
Stratigraphy and history of the Quaternary Period with emphasis on glaciation. Laboratory studies on glacial deposits. Field trips. A previous course in geomorphology is recommended.

Earth 456  F  3C  0.5
Numerical Methods in Geoscience
Prereq: Math 113 and an introductory course in computer programming.

Earth 461  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 360 and an introductory course in computer programming.

Earth 470  F  3C,2L  0.5
Metallic Mineral Deposits
The petrology and genesis of metalliferous ore deposits. The description of classic deposits; the stability of ore minerals; ore minerals in aqueous systems. The laboratory will include instruction and practice in ore microscopy.
Prereq: Earth 370

Earth 480  S  fldlab  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. Expenses are to be paid by the student.
Prereq: consent of the instructor.

Earth 490  F  fldlab
Field trip
Eight-day trip to the Quebec Appalachian Orogenic Belt, including study of stratigraphy, structural style and tectonic evolution of the overthrust belt in the vicinity of Quebec City, and the ophiolite belt and related rocks of the Eastern Townships. An acceptable report/synthesis is required for credit in the course.
Department of Economics

Professor, Chairman
J. Hotson, BA (Colorado College), MA, PhD (Penn)

Associate Professor, Associate Chairman
K. M. Bennett, BA, MA (Queen's), PhD (McGill)

Professor, Graduate Officer
L. Needleman, MA (Oxford), PhD (Glasgow)

Assistant Professor, Undergraduate Officer
S. W. Kardasz, BA (Loyola), PhD (Queen's)

Assistant Professor, Director of Accounting Programmes
G. W. Russell, MBA (McMaster), RIA

Professors
L. G. Eckel, BA, BComm (Sask.), MBA, PhD (Michigan), FCA
J. R. Hanna, BComm (McMaster), MBA, PhD (Michigan), FCA
S. K. Ghosh, BSc, MSc (Calcutta), MS, PhD (Wisconsin)
A. Koutsoyiannis, BA (Athens), PhD (Manchester)
Recipient of the Distinguished Teacher Award

Associate Professors
D. T. Carter, BComm, MBA (Windsor), CA
L. P. Fletcher, BComm (Mount Allison), AM, PhD (Brown)
H. M. Herauf, BComm (Sask.), MBA (Mich.), CA
D. J. Johnston, BComm, MBA (Queen's), CA
R. R. Kerton, BComm (Toronto), MA (Carleton), PhD (Duke)
N. E. Lavigne, CR, BA (W. Ont.), MComm (Ottawa), MBA (Detroit) J
S. N. Laiken, BA (Western), MBA (Wharton), PhD (Western)
W. M. Lemon, BA (Western), MBA (Toronto), PhD (Texas at Austin), CA, CPA
R. A. Long, BComm (Br. Col.), MBA (Washington), CA
A. R. Olsen, BComm (Sir G. Wms.), MBA (W. Ont.)
W. R. Needham, BComm (Carleton), MA, PhD (Queen's)
W. R. Thrisk, BA, MA (Br. Col.), PhD (Yale)

Assistant Professors
A. A. Andrikopoulos, BA (Athens), MA (Wayne State), PhD (Southern California)
J. Brox, BA (Toronto), MA, PhD (McMaster)
M. C. Howard, BA, MA (Lancaster), PhD (Leicester)
E. F. Kirzner, BA, MBA (Toronto)
R. C. Kumar, BStat, MStat, (Indian Statistical Institute), MA, PhD (Toronto)
K. R. Stollery, BA (Southern California), MA, PhD (Queen's)

Lecturers
E. Carvalho, BA, MA (Waterloo)
I. D. Duncan, BSc, MBA (York), RIA
E. W. Lau, BA (Toronto), MA (Manchester)
S. M. Riczu, BMath (Waterloo), CA

Adjunct Faculty
J. Ambrose, MBA (McMaster)
W. A. Campbell, BA, MBA (York), RIA
I. Duncan, BA (Brock), LLB (Osgoode)
F. R. Harvey, BSc (Toronto), CA
A. Headlam, MBA (Wilfrid Laurier), FCA
W. D. Jenkins, BA, LLB (W. Ont.)
R. K. Kilimnik, BA (Waterloo), MBA (McMaster) CFA
J. Moore, BA (W. Ont.), CA
F. Starke, BMath (Waterloo), CA
K. A. Tambling, BSc (McGill), MBA (W. Ont.)
D. Thomson, BMath (Waterloo), CA

Course Descriptions

Economics

Introduction to Modern Economics
A study of the principles of modern economics that contribute to an understanding of the operation of the Canadian economy. Micro- and macro-concepts are integrated in a Post-Keynesian framework.

Introduction to Microeconomics
An introduction to the central economic problems of society, the functioning of a mixed capitalistic enterprise system, the economic role of government, the composition of and pricing of national output, pricing of productive factors, and income distribution.

Introduction to Macroeconomics
Determination of national income; the banking system; government fiscal and monetary policy; international trade and finance; and current economic problems.

Econ 100a/100b F,W 3C 0.5/0.5
Introduction to Modern Economics

Econ 101 F,W,S 3C 0.5
Introduction to Microeconomics

Econ 102 F,W,S 3C 0.5
Introduction to Macroeconomics

Some Economics courses do not have a “term offered” indicated. This information will be available at pre-registration and students can confirm the “term offered” with their Departmental advisor.

The “normal” number of lectures per week in each course is three; however, each instructor determines how often his particular class will meet.
Econom 103  F, W  0.5
Introduction to Economic Concepts and Current Problems
The course presents the ideas of the great economists from Adam Smith to J.M. Keynes. The focus of the course is on the use of economic theory to understand the behaviour of consumers and of large corporations in the modern industrial world, and on the solution of such urgent current problems as stagflation, population, the economic policies of large conglomerate business, the arms race, urban congestion, and resource uses. The course has a structure which is based on J.K. Galbraith's televised series, "The Age of Uncertainty." Only one of Econ 101 and 103 may be taken. Offered by correspondence only.

Econ 191  F, W  2C, 1L  0.5
Financial Accounting 1
An introduction to the principles and practices underlying the historical-cost income determination model.
Note: Restricted to students required by their programme to take Economics 191, or to students registered in Economics 101, 193, and CS 112 or 140.

Econ 192  F, W, S  2C, 1L  0.5
Financial Accounting 2
Emphasis is given to asset and liability valuation. The nature and analysis of costs, and the usefulness and limitations of accounting data for decision-making.
Prereq: Econ 191.
Note: Restricted to students who have obtained at least a "C-" in Economics 191.

Econ 193/194  F, W  3C  0.5/0.5
Economics and the Administrator 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: Econ 193 is a prerequisite for Econ 194 and should be taken prior to P Sci 331

Econ 201  F, W, S  3C  0.5
Microeconomic Theory
Theory of consumer demand; production theory; market structure; resource pricing and allocation under perfect and imperfect competition.
Prereq: Econ 101 or 103 or 100a

Econ 202  F, W, S  3C  0.5
Macroeconomic Theory
Theory of the determination of the level of national income, employment and the price level.
Prereq: Econ 102 or Econ 100b

Econ 211  F, W, S  3C  0.5
Mathematics for Economists
Application of elementary mathematics to problems in economic theory. Topics include the graphing of functions, elementary exponential and logarithmic functions and differentiation - all developed within the context of economic theory.
Prereq: Econ 101/102 or 103/102 or 100a/100b

Econ 221  F, W  0.5
Statistics for Economists
An introduction to the underlying logic of statistical procedures most commonly employed by economists. No mathematical training beyond high school algebra is presumed. Emphasis is given to solving problems as a way of learning statistical theory.
Prereq: Econ 101/102 or 103/102 or 100a/100b

Econ 231  F, W  3C  0.5
Introduction to International Economics
Theory of comparative advantage and the gains from trade; tariff theory; concepts and measurement of balance of payments; exchange rate systems; reform of international monetary system.
Prereq: Econ 101/102 or 103/102 or 100a/100b

Econ 241  W  3C  0.5
Cost-benefit Analysis and Project Evaluation
Methods for evaluating private and public projects; decision rules, efficiency conditions and methods of conducting cost-benefit analysis. Application of the technique.
Prereq: Econ 201

Econ 261  F  3C  0.5
Understanding and Using Financial Accounting Information
This course is designed for non-accounting majors to help them understand and analyze financial statements.

Econ 262  W  3C  0.5
Understanding and Using Managerial Accounting Information
This course is designed for non-accounting majors. The use of accounting information to assist in planning, control and managerial decision-making will be examined.
Prereq: Econ 281
## Department of Economics: Course Offerings

<table>
<thead>
<tr>
<th>1st Year</th>
<th>2nd Year</th>
<th>3rd Year</th>
<th>4th Year</th>
<th>Subject Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>101 Intro. Modern Economics</td>
<td>201 Microeconomic Theory</td>
<td>301 Intermediate Microeconomics</td>
<td>401 Advanced Microeconomic Theory</td>
<td>Economic Theory</td>
</tr>
<tr>
<td>101 Intro. Microeconomics</td>
<td>202 Macroeconomic Theory</td>
<td>302 Monetary Theory and Banking</td>
<td>402 Advanced Macroeconomic Theory</td>
<td></td>
</tr>
<tr>
<td>102 Intro. Macroeconomics</td>
<td>303 Economic Thought</td>
<td>403 Econ. Analysis, Forecasting, and Public Policy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>111 Mathematics for Economists</td>
<td>311 Intro. Math Economics</td>
<td>411 Mathematical Economics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>221 Statistics for Economists</td>
<td>321 Intro. Econometrics</td>
<td></td>
<td>Quantitative Economics</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>332 International Monetary Theory</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>333 Interregional Economics</td>
<td>432 International Economic Policy</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>335 Economic Development</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>341 Public Finance</td>
<td>336 Economic History</td>
<td>441 Economics of the Public Sector 1</td>
<td>Public Economics</td>
<td></td>
</tr>
<tr>
<td>342 Urban Economics</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>344 Consumer Theory</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>345 Industrial Organisation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>353 Population Economics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>355 Energy &amp; Natural Resources</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>357 Environmental Economics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>263 Canadian Economic History</td>
<td>361 North American Economic History</td>
<td>461 Comparative Economic Systems</td>
<td>Economic History and Contemporary Problems</td>
<td></td>
</tr>
<tr>
<td></td>
<td>363 Contemporary Canadian Prob. 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>364 Contemporary Canadian Prob. 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>365 Economic Development of Modern Europe, 1780-1973</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>381 - 389 Special Topics</td>
<td></td>
<td></td>
<td>Special Topics and Studies</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Econ 291  F,W,S  3C  0.5  
Financial Accounting 3  
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: Econ 192

Econ 292  F,W,S  3C  0.5  
Financial Accounting 4  
This course completes the coverage of intermediate financial accounting. It deals with problems related to the measurement of liabilities, accounting for income taxes and the recording and measuring of corporate equities. 
Prereq: Econ 291

Econ 293  F,W  3C  0.5  
Auditing  
A study of the attest function emphasizing ethical, legal, and statutory influences on the development of auditing standards. Elements of effective control structures, the concept of audit evidence and the evolution of reporting practices are examined. 
Co-requisite: Registration in Econ 292.

Econ 294  F,W  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.

Econ 301  F,W  3C  0.5  
Intermediate Microeconomics  
Distribution theory; production, consumption and general equilibrium analysis; welfare economics. 
Prereq: Econ 201

Econ 302  F,W  3C  0.5  
Monetary Theory and Banking  
Monetary theory and banking in an open economy; national policies for achieving full employment, price stability, and equilibrium in the balance of payments. 
Prereq: Econ 201, 202, 231

Econ 303  F  3C  0.5  
Economic Thought  
A critical survey of the development of economic thought from the pre-Socratics to the Post-Keynesians. Emphasis on Classical Economics. 
Prereq: Econ 201, 202, 231

Econ 311  F,S  3C  0.5  
Introduction to Mathematical Economics  
Mathematical treatment of some micro- and macro -partial and general equilibrium models; programming and game theoretic techniques; stability analysis; simple growth models. 
Prereq: Econ 201, 202, 211 (or Math 130)

Econ 321  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. 
Prereq: Econ 221

Econ 331  F  3C  0.5  
International Trade Theory  
An examination of the modern theory of international trade. Topics include comparative advantage and the gains from trade, tariff theory, economic integration, and the interaction between international trade and economic growth. 
Prereq: Econ 201, 231

Econ 332  W  3C  0.5  
International Monetary Theory  
The monetary aspects of international economic relations. Topics include analyses of the foreign exchange and international capital markets, the theory of balance of payments policy, monetary integration, and reform of the international monetary system. 
Prereq: Econ 202, 231

Econ 333  F  3C  0.5  
Inter-regional Economics  
Application of economic theory to analyses of structural characteristics, growth and development in inter-regional systems. Models examined include input-output, export-base, shift-share, neo-classical, cumulative causation. 
Prereq: Econ 201, 231

Econ 335  W  3C  0.5  
Economic Development  
The nature of the problem of economic development; theories of economic development; major policy issues in economic development. 
Prereq: Econ 201, 202, 231

Econ 341  F  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; introduction to fiscal federalism. 
Prereq: Econ 201
Econ 343  W  3C  0.5  
**Urban Economics**
Application of economic analysis to location decisions of firms and households; discussion of policy problems, for example, urban renewal and housing.
*Prereq: Econ 101 or 103 or 100a (Econ 201 is recommended)*

Econ 344  W  3C  0.5  
**Consumer Theory**
The development of economic principles for consumer analysis. The course appraises market responsiveness as well as conditions causing problems for public and private consumption. It also evaluates alternative economic policies for correcting such conditions.
*Prereq: Econ 201*

Econ 345  F  3C  0.5  
**Industrial Organization**
An analysis of the characteristics of industrial structure, behaviour and performance with special reference to Canada. Competition and “rationalization” policy in Canada and other selected countries.
*Prereq: Econ 201*

Econ 351  F  3C  0.5  
**Labour Economics**
Wage theory, training and mobility theory; economics of information in Canadian labour markets; other investments in human capital; manpower policies.
*Prereq: Econ 201*

Econ 353  W  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. The political economy of the world’s supply of and demand for energy resources and major issues in Canadian energy policy will be considered.
*Prereq: Econ 201 (Econ 241 is recommended)*

Econ 357  W  3C  0.5  
**Environmental Economics**
Application of economic theory to problems of the environment, in particular, air, water, and land pollution. Emphasis is on the theory of the management of common property resources.
*Prereq: Econ 201*

Econ 361  **North American Economic History**  
*Not offered in 1981-82*

Econ 363/364  F,W  3C  0.5/0.5  
**Contemporary Canadian Problems 1, 2**
A “topic oriented” seminar course. The class agrees to study a Canadian problem selected from a list that includes poverty, unemployment, industrial policy, 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 or 103/102 or 100a/100b*

Econ 381-389  3S  0.5 each  
**Special Topics**
One or more special half courses will be offered at different times as announced by the Department.
*Prereq: Consent of Instructor*

Econ 391  F,W,S  3C  0.5  
**Cost and Management Accounting 1**
Concepts underlying the use of cost accounting information for managerial planning and control. Introduction of product costing, overhead cost analysis, standard cost systems and responsibility accounting.
*Prereq: Econ 292*

Econ 392  F,W  3C  0.5  
**Cost and Management Accounting 2**
Consideration of more complex topics in management planning and control. Topics include overhead allocations, transfer pricing, performance appraisal, income measurement, and the determination of cost behaviour.
*Prereq: Econ 191*
Econ 393  F,W,S  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 101 or 103, 102, 192, 221.

Econ 394  F,W  3C  0.5  
Managerial Finance 2
The theoretical concepts examined in Economics 393 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: Econ 393

Econ 401  F  3C  0.5  
Advanced Microeconomic Theory
Production and consumption theory; advanced theory of oligopoly; price competition; non-price competition; growth decisions of the firm; financial decisions of the firm; decision-making under risk and uncertainty.  
Prereq: Econ 301

Econ 402  W  3C  0.5  
Advanced Macroeconomic Theory
Classical and Keynesian models and recent contributions; theory of economic policy; inflation and unemployment; modern theories of economic growth.  
Prereq: Econ 301, 302

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 in the impact of policies, and so forth.  
Prereq: Econ 301, 302, 321

Econ 411  Mathematical Economics
Not offered 1981-82

Econ 413  W  3C  0.5  
Economic Growth Theory
Classical, neoclassical, and Cambridge theories of growth, study of production, technical progress, and consumption; aggregate and two-sector models of growth; growth theory in an open economy.  
Prereq: Econ 301, 302, 311

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 macroeconomics; empirical models.  
Prereq: Econ 201, 202, 211, 221, 321

Econ 431  Advanced International Economics
Not offered 1981-82

Econ 432  W  3C  0.5  
International Economic Policy
Analysis of selected policy problems of open economies, such as optimum tariff and balance of payments stabilization, International capital flows, monetary and fiscal policy mix, multinational firms, international monetary reform and the new international economic order.  
Prereq: Econ 301, 302, 331 and 332

Econ 441  F  3C  0.5  
Economics of the Public Sector 1
An overview of fiscal functions and institutions; the theory of social goods; expenditure and revenue structures; fiscal incidence.  
Prereq: Econ 231, 301, 302, 341

Econ 442  W  3C  0.5  
Economics of the Public Sector 2
Fiscal stabilization, fiscal federalism, public pricing, international public finance, social security and other contemporary policy issues.  
Prereq: Econ 441

Econ 451  3C  0.5  
Advanced Topics in Resource Economics
Advanced analysis of selected topics in the area of energy, land, and labour resources.  
Prereq: Econ 201, 202, 231, 355

Econ 461  Comparative Economic Systems
This course seeks to explain and evaluate various theoretical frameworks utilized in the analysis of different types of Economic Systems. The emphasis is placed upon those frameworks applicable to capitalism and socialism. Topics which are dealt with include Marx's theory of capitalism, the analysis of decentralized Economic Systems in terms of Modern Wairaeian theory, theories of monopoly capitalism, the development and operation of the Stalilnist Command Economy, alternative principles of Socialist Economic Organization and various types of planning procedures.  
Prereq: Econ 201 and 202
Econ 481-489 3S 0.5 each

Special Studies
Research and reading courses under the direction of individual instructors.
Admission by consent of instructor.

Econ 491 F, S 3C 0.5

Financial Accounting 5
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: Econ 392

Econ 492 W, S 3C 0.5

Seminar in 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: Econ 393 and 491

Econ 493 F 3C 0.5

Taxation 1
A course in the interpretation of the Canadian Income Tax Act, the common law pertaining to taxation, and the pronouncements of Revenue Canada – Taxation on tax topics. The emphasis will be the taxation of individuals.
Prereq: Econ 292

Econ 494 W 3C 0.5

Taxation 2
Analysis and interpretation of the Income Tax Act, common law, and departmental practice dealing with estates, trusts, partnerships, and corporations. Topics will include incidence of tax, rollovers, deferrals, distributions, determination of taxable income, and tax payable.
Prereq: Econ 493

Econ 495 W 3C 0.5

Accounting Information Systems
The course 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: Econ 391/392
Department of Electrical Engineering

Professor, Chairman
I. F. Blake, BSc, MSc (Queen's), MA, PhD (Princeton), PEng

Professor, Associate Chairman for Graduate Affairs
J. W. Mark, BASc (Toronto), MEng, PhD (McMaster), PEng

Professor, Associate Chairman for Undergraduate Affairs
R. S. Ramshaw, BSc; PhD (Nottingham), PEng

Professor, Dean of Graduate Studies
L. A. K. Watt, BSc (Chicago), PhD (Minnesota)

Professor, Director Computer Communications Network Group
E. G. Manning, MSc (Waterloo) PhD (Illinois)

Professors
P. R. Bryant, MSc (London), MA, PhD (Cambridge)
S. G. Chamberlain, MSc, PhD (Southampton)
J. D. Cross, BSc (Wales), MS PhD (Carleton), PEng
E. L. Heasell, BSc, PhD (Imperial College, London)
R. H. MacPhie, BASc (Toronto), MS, PhD (Illinois)
S. N. Kalra, BSc (Punjab), MS, PhD (Illinois), PEng
H. C. Ratz, BASc (Toronto), MS (MIT), PhD (Sask), PEng
J. Reeve, BSc, MSc, PhD, DSc (Manchester), PEng
D. J. Roulston, BSc (Belfast), PhD (Imperial College, London), CEng
K. D. Srivastava, BSc, BE (Hons) (Roorkee), PhD (Glasgow), PEng
M. Vidyasagar, BSc, MASc, PhD (Wisconsin)
J. Vlach, Dipl Ing CSc (Technical University of Prague)
L. Y. Wei, BS (National Northwestern College, China), MSc, PhD (Illinois)

Associate Professors
J. D. Aplevich, BE (Sask.), PhD (Imperial College, London), PEng
Y. L. Chow, BEng (McGill), MASc, PhD (Toronto) PEng
M. E. Elmasry, BSc (Cairo), MASc, PhD (Ottawa), PEng
J. A. Field, BE (Sask.), MASc, PhD (Toronto), PEng
J. V. Hanson, BASc (Toronto), MSc, PhD (Imperial College, London)
T. Kameda, BSc, MS (Tokyo), PhD (Princeton)
J. S. Keeler, BASc, MASc (Toronto), PEng

Assistant Professors
S. K. Chaudhuri, PhD (Manitoba)

Adjunct Professors
R. G. Anthes, BASc, MASc (Toronto), PEng
J. Carr, PhD (Waterloo)

Lecturers
J. T. Mowchenko, BASc (Saek)

Laboratory Director
R. L. Wright, PEng

Faculty member holding cross-appointment as shown
*Department of Computer Science

Course Descriptions

Electrical Engineering

El E 14 W,F 3C,3L,1T 0.5
Electrical Engineering 1
Kirchhoff's Laws, mesh current equations, superposition theorem, measuring instruments, phasors, power distribution and three-phase circuits, power factor and its correction, magnetic circuits, transformers, introduction to dc and ac motors.
*Alternate weeks.
Prereq: Gen E 122, Math 110a & b, Math 114, or equivalent.

El E 32 F,W 3C,3L,1T 0.5
Electrical Engineering 2
Introduction to electronic devices and their characteristics; integrated circuits; operational amplifiers; digital circuits and systems; electric power control using semiconductor devices and circuits; electronic instruments and instrumentation systems.
*Alternate weeks.

El E 116 W,S 2C,3L,1T 0.75
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 Electrical Engineering; and introduction to engineering design methods as applied to Electrical engineering and including specification development, information-gathering, concept formulation, feasibility analysis and report writing.
El E 201  W,F  1C  0.0
Seminar
General Seminar

El E 202  F,S  1C  0.0
Seminar
General Seminar

El E 205 (Math 211)  W,F  2C,2T  0.5
Advanced Calculus for Electrical Engineers 1
Differential equations; partial differentiation of functions of two or more variables; multiple integrals; line and surface integrals.

El E 206 (Math 212)  S,F  2C,2T  0.5
Advanced Calculus for Electrical Engineers 2
Fourier series, partial differential equations, separation of variables, wave equation, heat equation and Laplace's equation. Fourier integral, properties of complex analytic functions, complex integration.

El E 222  W,F  2C,1T,2L  0.5
Introduction to Digital Computers

El E 233  W,F  3C,1T  0.5
Physical Electronics
Particle and wave theory of light, photoelectric effect, Compton effect. Structure of hydrogen atom; many-electron atoms. Solid state physics: semiconductors, n and p-type materials, Fermi levels, mass action law, charge neutrality, diffusion. Introduction to p-n junctions.

El E 241  W,F  3C,2T  0.5
Electrical Networks 1
Introduction to network variables and laws, resistors, sources and simple circuits; resistance networks; capacitors and inductors; first order circuits, sinusoidal steady-state analysis.

El E 261  S,F  3C,1T  0.5
Energy Processing and Conversion

El E 271  S,F  3C,1T  0.5
Electric and Magnetic Fields
Vector analysis, Coulomb's law and electric field intensity; electric flux density; Gauss' law and divergence; energy and potential; conductors, dielectrics, capacitance; experimental mapping methods; Poisson's and Laplace's equations; the steady magnetic field; magnetic forces, materials and inductance; time varying fields and Maxwell's equations.

El E 293  W,F  1C,4L  0.5
Measurement and Instrumentation 1
The principal objectives of this course are to introduce students to the methods and techniques for measuring electrical variables and parameters and to give them laboratory experience with electrical instruments, devices and circuits. Instruments studied include oscilloscopes, multimeters, power supplies, dc and ac bridges, signal generators and electronic volt meters. The devices and circuits include: linear and non-linear resistors, capacitors and inductors; RC, RL and RLC networks. 'Open Lab.'

El E 294  S,F  1C,1T,3L  0.5
Measurement Instrumentation 2
Experiments related to material covered in courses El E 261 and El E 271 will be performed. This course also includes further topics on instrumentation and measurement techniques. 'Open Lab.'

El E 301  W,S  1C  0.0
Seminar
General Seminar

El E 302  W,F  1C  0.0
Seminar
General Seminar

El E 316  W,S  2C,2T  0.5
Probability and Statistics
Conditional probability and independence; Bayes' Theorem; random variables; functions of random variables; distribution functions; applications to reliability and failure rates; marginal and conditional distributions; correlation and applications to regression and statistical testing.

El E 317  W,F  3C,1L  0.5
Signal Analysis Methods
Representation of periodic and non periodic signals in both continuous time and discrete time forms; the concept of sampling; the development and application of Fourier series, Fourier transforms, and the convolution integral to continuous time signals and systems; linear modulation, and modulation techniques such as DSB, AM, SSB, etc.; the z-transform and its application to discrete time sequences and systems.
<table>
<thead>
<tr>
<th>Course Description</th>
<th>Prerequisites</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>El E 342</strong> Electric Networks 2</td>
<td>Review of sinusoidal steady-state, node, and mesh analysis; the Laplace transformation and applications; transient response of second and higher order circuits; two-part network parameters.</td>
<td>0.5</td>
</tr>
<tr>
<td><strong>El E 351</strong> Electronic Devices</td>
<td>Review of semiconductor properties, Boltzmann relations. Derivation of dc and ac characteristics of p-n junctions and bipolar transistors. Small and large signal models, Introduction to field effect transistors. <em>Alternate weeks.</em></td>
<td>0.5</td>
</tr>
<tr>
<td><strong>El E 352</strong> Electronic Circuits</td>
<td>Large-signal amplifiers; biasing networks and stability, single and multi-stage small-signal amplifiers; the hybrid-pi model; high and low frequency effects; feedback amplifiers and stability criteria; oscillators; noise in electronic circuits. <em>Alternate weeks.</em></td>
<td>0.5</td>
</tr>
<tr>
<td><strong>El E 362</strong> Energy Conversion</td>
<td>Electric motors and generators. <em>Alternate weeks.</em></td>
<td>0.5</td>
</tr>
<tr>
<td><strong>El E 372</strong> Transmission Lines and Electro Magnetic Fields</td>
<td>Transmission lines; distributed parameters; telegrapher's equations; sinusoidal waves; terminated lines, matching with the Smith Chart; Electromagnetic Fields; Maxwell's equations; plane waves; reflection and refraction; Poynting vector; waveguides. <em>Alternate weeks.</em></td>
<td>0.5</td>
</tr>
<tr>
<td><strong>El E 380</strong> Introduction to Systems and Control</td>
<td>An introduction to control. Advantages of closed-loop feedback systems. The role of the system mathematical model. Block diagrams and signal flow graphs. The basic control system design problem, stability in control systems. Frequency response analysis techniques. <em>Alternate weeks.</em></td>
<td>0.5</td>
</tr>
<tr>
<td><strong>El E 401</strong> Seminar</td>
<td>General Seminar</td>
<td>0.0</td>
</tr>
<tr>
<td><strong>El E 402</strong> Seminar</td>
<td>General Seminar</td>
<td>0.0</td>
</tr>
<tr>
<td><strong>El E 407</strong> Numerical Methods</td>
<td>Fundamentals of numerical methods, solution of non-linear equations, polynomials and zeros of polynomials, matrix methods and systems of linear algebraic equations, interpolation, estimation of parameters by least squares, numerical integration, solution of ordinary differential equations.</td>
<td>0.5</td>
</tr>
<tr>
<td><strong>El E 418</strong> Communication Systems</td>
<td>Review of signal analysis and linear modulation; angle modulation and FM spectra; noise in circuits and communication channels; noise figure and noise temperature; performance of linear and exponential modulation systems in the presence of noise; analog pulse modulation, PAM, PPM, PDM; noise in pulse modulation systems. <em>Open.</em></td>
<td>0.5</td>
</tr>
<tr>
<td><strong>El E 419</strong> Digital Communication</td>
<td>Review of sampling and quantization; data transmission and digital data systems; pulse code modulation, and delta modulation; noise and errors in pulse communications; matched filters, probability of error and correlation detection; intersymbol interference, distortion and equalization; signal design and transmission line coding; introduction to channel capacity and error control coding.</td>
<td>0.5</td>
</tr>
<tr>
<td><strong>El E 425</strong> System Simulation</td>
<td>A study of computer simulation techniques; principles of analog computation; models, scaling procedures; digital simulation languages, computer simulation and investigation of continuous systems; differential equations, transfer functions, boundary value problems; application of hybrid computers. <em>Open.</em></td>
<td>0.5</td>
</tr>
<tr>
<td><strong>El E 426</strong> Software Engineering</td>
<td>Block structured languages (Algol), actual and formal parameters, recursion, formal description, relationship to machine code. Structured programming. Data structures, arrays, lists, stacks, associative structures. Searching and sorting. Compilers. Operating system organization, cooperating processes, process synchronization primitives. <em>Project.</em></td>
<td>0.5</td>
</tr>
</tbody>
</table>
**Course Descriptions**

**Electrical Engineering**

**El E 427 S,F 2C,1T,1L' 0.5**

**Digital Hardware Engineering**


**El E 434 W 2C,2T 0.5**

**Quantum Electronics and Magnetics**

Laser principles; solid state, semiconductor and gas lasers. Laser applications, holography. Ferromagnetism, ferrimagnetism, diamagnetism and paramagnetism, electron-spin resonance, core and bubble memories.

**El E 435 S,F 2C,2T 0.5**

**Semiconductor Devices 1**

This course deals with the theory and characteristics of modern semiconductor devices, SCRs, power rectifiers, MOSFETs, JFETs, radiation detectors, solar cells, LEDs, CCDs, IMPATT and Gunn effect devices, step recovery diodes, p-i-n diodes, Schottky diodes, memory devices.

**El E 436 W 3C,1T 0.5**

**Semiconductor Devices 2**

Techniques for the design and realization of discrete and integrated circuit elements, bipolar, JFET and MOSFET models. Integrated circuit biasing. Design and implementation of logic circuit elements. Semiconductor memories; RAMs, ROMs, shift registers.

**El E 443 W 2C,1T 0.5**

**Electric Networks 3**

Two-port descriptions of ideal active devices; simulation of nonideal linear active devices; formulation and solution of network equations; network functions and their sensitivity in the frequency domain; introduction to passive and active filters, approximation theory and simple synthesis; time domain solutions; computer-aided analysis and design of networks, simulation of nonideal nonlinear devices. *Prereq: El E 342 or equivalent.*

**El E 446 S,F 2C,2T 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 453 W 2C,1T,3L' 0.5**

**Linear Electronic Circuits**


**El E 454 S,F 2C,1T,1L' 0.5**

**Nonlinear Electronic Circuits**

Switching characteristics of semiconductor devices, non-sinusoidal wave generation and shaping, voltage and current sweeps, binary circuits and gates, digital integrated circuits, DCTL, DTL, ECL, T* and I*.

*Open.*

**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, electroacoustical systems, human audiology, acoustical measurements, audio electronics and applications. *Every third week*

**El E 463 S,F 2C,1T,1L' 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. *Open.*

**El E 464 W 3C,3L' 0.5**

**High Voltage and Insulation Engineering**

Nature and origin of high voltage surges encountered on power systems. Travelling 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. *Alternate weeks*
Power Systems
Introduction to system concepts; aspects of power system planning and operation. Energy sources; environmental and resource implications. Per-unit and co-ordinate systems. Representation of equipment such as generators, transformers and transmission lines in system analysis. Analysis of unbalanced 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.

Microwave Engineering
Rectangular and circular waveguides; simple waveguide discontinuity; periodic transmission systems; microwave scattering theory; ferrite components; klystrons; travelling-wave amplifiers; backward-wave oscillator, magnetron; solid-state microwave devices.

Antenna and Propagation Engineering
An introduction to the theory of radiation and of antenna and propagation engineering; linear antennas, linear arrays, aperture antennas, frequency independent antennas, measurement theory; ground wave propagation, ionospheric propagation, plasmas.

Control Systems 1

Control Systems 2

Prereq: EI E 446, EI E 481
### Department of English

**Associate Professor, Chairman of Department**

W. R. Macnaughton, BA (Toronto), MA, PhD (Wisconsin)

**Associate Professor, Associate Chairman and Undergraduate Officer**

R. R. Dubinski, BA, MA (W. Ont.), PhD (Toronto)

**Associate Professor and Graduate Officer**

G. E. Slethaug, BA (Pacific Lutheran), MA, PhD (Nebraska)

**Professor and Associate Dean, Special Programmes**

K. L. Ledbetter, AB (Central College, Mo.), MA, PhD (Illinois)

**Professors**

L. A. Cummings, AB (Washington), AM (Missouri), PhD (Washington)

J. Gold, BA (Birmingham), PhD (Wisconsin)

J. C. Gray, BA (Washington State), MA (Connecticut), PhD (Syracuse)

G. R. Hibbard, BA, MA (London)

W. R. Martin, BA, MA, D Litt et Phil (South Africa)

Recipient of the Distinguished Teacher Award

W. U. Ober, BA (Washington and Lee), PhD (Indiana)

W. K. Thomas, MA, PhD (Toronto)

H. Tuyn, MA (Utrecht and Oxon), Docteur de l'Université de Paris R

**Associate Professors**

P. D. Beam, BA (Waterloo), MA (McMaster), PhD (Toronto)

A. L. Dust, MA, PhD (Illinois)

H. B. Ellis, BA (Rutland), MA, PhD (Illinois)

S. Fogel, BA (Carleton), MA (Br. Col.), PhD (Purdue)

R. N. Gosselin, BA (Kansas), MA, PhD (Colorado)

P. M. Hinchcliffe, BA (Br. Col.), MA, PhD (Toronto)

N. C. Huittin, BA (Concordia), MA (Chicago), PhD (Johns Hopkins)

D. R. Letson, BA (Waterloo), MA (McMaster), PhD (Toronto)

R. Lister, BA, MA, PhD (Toronto)

H. M. Logan, AB (Franklin and Marshall), PhD (Pennsylvania)

E. P. McCormack, MA (Glasgow), PhD (Manitoba)

J. S. North, BA, MA (Br. Col.), PhD (Alberta)

E. F. Shields, BA (Chestnut Hill), MA (Villanova), PhD (Illinois)

J. S. Stone, BA, MA (Br. Col.)

**Assistant Professors**

M. A. Gerhardstein, MA (Montana), PhD (Iowa)

C. E. McGee, BA, MA, PhD (Toronto)

S. E. McMullin, BA (Carleton), PhD (Dalhousie)

**Lecturers**

L. Dorney, BA, MA (Louisville) (part-time)

J. Miller, BA, BLS (McGill), MA, MPhil (Waterloo) R (part-time)

* Jointly appointed from Architecture

**For courses in Drama, see Drama and Theatre Arts Group in this Chapter.**

Although the Department of English provides advisors to help students to choose their programmes, to arrange their courses and to conform with the University, Faculty, and departmental regulations, students are urged to study the Calendar very carefully because they are themselves responsible for failure to abide by these regulations.

**Note 1**

W. K. Thomas's Correct Form of Essay Writing is the official style sheet for all undergraduate English courses.

**Note 2**

The "normal" number of lectures per week in each course is three; however, instructors determine how often their particular class will meet.

**Note 3**

In all English courses, emphasis will be placed on student essays written in connection with the reading.

**Course Descriptions**

Consult the time-table for an up-to-date list of courses offered in 1981-82.

**Group One**

1) Courses in this group count towards a degree as electives in any programme in the University. None of them, however, may be counted as an English Major credit; in other words, none of them fulfills a core requirement for a General or an Honours programme in English.

A) Courses in Group 1(A) are primarily concerned with assisting students to improve their writing.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engl 109</td>
<td>Introduction to Essay Writing 1</td>
</tr>
<tr>
<td>Engl 110</td>
<td>Introduction to Essay Writing 2</td>
</tr>
<tr>
<td>Engl 129R</td>
<td>Introduction to Written English</td>
</tr>
<tr>
<td>Engl 209</td>
<td>Advanced Essay Writing</td>
</tr>
<tr>
<td>Engl 210</td>
<td>Report Writing</td>
</tr>
<tr>
<td>Engl 309</td>
<td>Seminar in Essay Writing</td>
</tr>
<tr>
<td>Engl 335</td>
<td>Creative Writing</td>
</tr>
</tbody>
</table>

Consult the time-table for an up-to-date list of courses offered in 1981-82.
B) Courses in Group 1(B) are primarily designed to make students aware of the different functions of language in various contexts to assist them to improve their writing.

Engl 150 English as an Instrument of Thought and Communication 1
Engl 151 English as an Instrument of Thought and Communication 2
Engl 140R The Use of English 1
Engl 141R The Use of English 2
Engl 240R Form and Function 1
Engl 241R Form and Function 2

Note
Courses are administered by Renison College.

1A)
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 twelve short writing assignments are required.

Also offered at St. Jerome's College.

Engl 110 W 0.5
Introduction to Essay Writing 2
The course teaches the construction of the persuasive essay, with attention to the elements of logical thinking, to the techniques of successful persuasion, and to the demands of the library research paper. Six to eight writing assignments are required.

Prereq: Engl 109

Engl 129R F,W,S 1C,2L,2T 0.5
Introduction to Written English
Instruction provided in basic grammar, sentence and paragraph structure, elements of composition and essay writing including focus on theme, development of central idea, exposition and argumentation. Minimum of four hours of instruction each week with additional tutorial hours as required.

Prereq: Open only to students whose maternal language is not English and who lack language mastery sufficient for admission to other introductory English language courses.

Engl 209 F 0.5
Advanced Essay Writing
Provides further opportunities for serious students of writing to study and to practise descriptive, expository, argumentative, and persuasive writing. In addition to lectures, there are workshop sessions in which student writing is discussed.

Prereq: Second-year standing or above

1B)
Engl 210 F,W,S 0.5
Report Writing
The many functions of the report – an orderly and objective communication of factual information which serves some specific purpose – are taught. Students will receive practice in research, in organization, and in writing many kinds of reports.

Prereq: Second-year standing or above

Engl 309 Seminar in Essay Writing
Not offered in 1981-82.

Engl 335 Creative Writing
Aimed at encouraging students to develop their creative and critical potentials, the course consists of supervised practice, tutorials, and seminar discussions.

Prereq: Second-year standing or above

Engl 150 F,W 0.5
English as an Instrument of Thought and Communication 1
The course is designed to improve the reading and writing of students from all disciplines. In order to develop clarity of thought and critical awareness, students will identify and study in several media the various ends that are served by language: objective reporting; persuasion; argument; and emotional, social, and artistic expression. About eight written exercises are assigned.

Prereq: English 150

Engl 151 W 0.5
English as an Instrument of Thought and Communication 2
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 140R F,W 0.5
The Use of English 1
The use and abuse of spoken and written English. The study and evaluation of language as it is used for various purposes (e.g. colloquial, scientific, legal, political, commercial, journalistic, literary) in order to increase critical awareness and to help students to write clearly and effectively.

Prereq: Engl 140R

Engl 141R W 0.5
The Use of English 2
A continuation of Engl 140R. The study of factual, emotive, scientific and imaginative writing; relevance, context; meaning, tone, feeling and intention.

Prereq: Engl 140R
Engl 240R  F  3C  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.

Engl 241R  Form and Function 2
Not offered in 1981-82

Note
R Courses are administered by Renison College

Group Two

Courses in this group carry degree credit and may be counted as fulfilling the minimum requirements for a General or Honours programme in English.

Engl 102  Y  1.0
The Major Forms of Literature
Different kinds of literature will be explored so as to discover how the shape of a literary work contributes to its meaning. Students will read ballad, lyric, and narrative poetry; classic tragedy and comedy and absurdist, existential and expressionist plays; novels and short stories.

Engl 105  Y  1.0
Twentieth-Century Literature in English
A close examination of a representative selection of works by major British, Canadian, American and other authors writing in English.

Engl 108 Themes of Literature
An exploration of the great variety of literature through thematic perspectives.

Engl 108A  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 108B  0.5
Utopia and Anti-Utopia
This course will attempt to acquaint the student with forms of the literary artist's moral vision of man in "Utopian" writings. It will involve an examination of the role of the imagination in helping to inform and embody cultural ideas of various periods.

Engl 108C  0.5
Literature and Morality
Works in English literature from its beginnings are selected for their bearings on questions of morality.

Engl 108D  The Quest Theme in Literature
Not offered in 1981-82.

Engl 108E  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 earth mothers, people, sex objects, and bitches.

Engl 108F  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 realization or in tragic defeat.

Engl 108H  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 108K  0.5
Literature and Science
A study of literature of various kinds and from various periods in which writers have dealt with science and shown the Influence of technology on human life.

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 200  Y  1.0
Survey of British Literature
An historical survey of major figures, types and trends in British literature from the Middle Ages to the present.

Also offered at St. Jerome's College.
Engl 200A 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 eighteenth century.
Also offered at St. Jerome's College.

Engl 200B 0.5
Survey of British Literature 2
An historical survey of major figures, types and trends in British literature from the late eighteenth century to the present.
Also offered at St. Jerome's College.

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 202 1.0
The Bible and Literature
The study of major themes, stories, myths, and characters of the Old and New Testaments of the King James Bible, and their influence on other English literature.

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 märchen will be discussed.

Engl 204 0.5
Introduction to Folklore 2
Similar to 203 but dealing with folk-drama, ballads, songs, medicine, riddles, chants, proverbs, and charms.

Engl 205R F,W,S 3C 0.5
The Canadian Short Story
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.

Note
R Courses are administered by Renison College.

Engl 208 0.5
Literary Genres and Themes

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.
Also offered at St. Jerome's College.

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 Thurber 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, Heller, Hiebert, 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 women 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.
Also offered at St. Jerome's College.

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 Carre 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 211/212
The Novel
The novel, by its nature, constitutes an attempt to formulate and to interpret the bewildering human experience. This course undertakes an exploration of the forms that attempt can take. British, Canadian, and American novels will be studied. The two halves of the course may be taken independently.
Also offered at St. Jerome’s College.

Engl 211 F 0.5
The Novel 1
A study of the novel in English from its beginnings to the late 19th century.
Also offered at St. Jerome’s College.

Engl 212 W 0.5
The Novel 2
A study of the novel in English from the late 19th century to the present.
Also offered at St. Jerome’s College.

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.
Also offered at St. Jerome’s College.

Engl 215 0.5
Canadian Regional Literature
The course will provide a survey of literature written about a distinctive region of Canada.

Engl 232 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 233 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 251 Y 1.0
The Practice and Theory of Criticism
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.
Also offered at St. Jerome’s College.

Engl 251A 0.5
The Practice and Theory of Criticism 1
The first half of Engl 251 (see above).
Also offered at St. Jerome’s College.

Engl 251B 0.5
The Practice and Theory of Criticism 2
The continuation of Engl 251A (see above).
Prereq: Engl 251A
Also offered at St. Jerome’s College.

Engl 305 Y 1.0
Old English
An introduction to the literature and language of pre-Conquest England. The principal literary methods, themes, and types of English literature up to the 12th century constitute the material of study in this course.
Also offered at St. Jerome’s College.

Engl 310 Y 1.0
Middle English
A study of Middle English literature with special emphasis on the work of Geoffrey Chaucer.
Also offered at St. Jerome’s College.

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.
Also offered at St. Jerome’s College.

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.
Also offered at St. Jerome’s College.

Engl 314 0.5
Canadian Poetry Since 1920
Also offered at St. Jerome’s College.
English

Enl 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.
Also offered at St. Jerome's College.

Enl 316  0.5
Canadian Drama
A study of plays by such dramatists as Merrill Denison, Robertson Davies, Gratien Gélinas (in translation), James Reaney, John Coulter, George Ryga, and Michel Tremblay (in translation).
Background for 20th-century drama will be provided in lectures.
(Cross-listed with Drama 351)

Enl 330  1.0
Elizabethan Literature (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. Reserved for special attention is Spenser’s epic poem glorifying Elizabeth 1 and England - The Faerie Queene.
Also offered at St. Jerome's College.

Enl 330A  F  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.
Also offered at St. Jerome's College.

Enl 330B  W  0.5
Elizabethan Literature 2 (excluding Drama)
The continuation of English 330A. Reserved for special attention is Spenser’s epic poem glorifying England and Elizabeth I - The Faerie Queene.
Prereq: 330A or consent of instructor.
Also offered at St. Jerome's College.

Enl 339  Contemporary British Literature
Not offered in 1981-82.

Enl 343  F  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.
Also offered at St. Jerome's College.

Enl 344  W  0.5
Modern American Literature
Approaches to reality amid the confusion and uncertainty of 20th-century America. Emphasis on such major writers as Faulkner, Miller, and Cummings.
Prereq: Enl 343
Also offered at St. Jerome's College.

Enl 345/346/347
Studies in American Literature
(Usually only one or two courses from this series are offered each year.)

Enl 345B  W  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: Enl 343 or consent of instructor.

Enl 346C  W  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: Enl 343 or consent of instructor.

Enl 347A  W  0.5
Contemporary American Literature
A study of American Literature from World War 2 to the present.
Prereq: Enl 343 or consent of instructor.
Also offered at St. Jerome's College.

Enl 350  Y  1.0
Seventeenth-Century Non-Dramatic Literature
Special attention will be given to the poetry of Donne, Jonson, Herrick, Herbert, Vaughan, and Marvell and to the prose works of Bacon, Burton, and Browne. Approximately half the course will be devoted to an intensive study of Milton's English poetry and a selection of his prose works.
Also offered at St. Jerome's College.

Enl 350A  0.5
Seventeenth-Century Non-Dramatic Literature 1
A study of secular and religious lyric poetry by poets such as Donne, Jonson, Herrick, Herbert, Vaughan and Marvell.
Also offered at St. Jerome's College.

Enl 350B  0.5
Seventeenth-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.
Also offered at St. Jerome's College.
Engl 362  F  0.5  Shakespeare 1
A study of the plays written prior to 1599-1600, excluding Julius Caesar.
Also offered at St. Jerome's College.

Engl 363  W  0.5  Shakespeare 2
A study of the plays written after 1599-1600, including Julius Caesar.
Also offered at St. Jerome's College.

Engl 365/366  1.0  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.
Also offered at St. Jerome's College.

Engl 373  1.0  An Introduction to the History of English
The process of linguistic change as exemplified in the development of the English language from its origins in Indo-European and Germanic through modern dialects. Traditional, structural and generative approaches will be employed.
Also offered at St. Jerome's College.

Engl 375  1.0  Linguistics and English Grammar
Linguistics and its application to the study of grammar and language. Included are 1) an introduction to descriptive and historical linguistics and the principles of linguistic analysis and 2) an evaluation of English grammars ranging from the traditional to the structural and transformational-generative.
Also offered at St. Jerome's College.

Engl 376R Our Changing Language: Syntax and Semantics 1
Not offered in 1981-82.

Engl 377R Our Changing Language: Syntax and Semantics 2
Not offered in 1981-82.

Engl 386R F  3C  0.5  Twentieth Century Literature 1
A survey of writing in the age of anxiety with particular focus on the psychoanalytic novel. The concept of the anti-hero in the various approaches. Emphasis will be placed on the satirical, emotional and intellectual writing in novels by Graham Greene, Aldous Huxley, D. H. Lawrence and Evelyn Waugh.

Engl 387R W  3C  0.5  Twentieth Century Literature 2
The course complements Engl 386R by studying the same topics in relation to modern dramas generally classified under the title of “The Theatre of the Absurd.”

Note
R courses are administered by Renison College.

Engl 400  1.0  The Development of English Literature
The course explores the origin, growth, and transformation of philosophical ideas and of literary themes, motifs, genres, forms, and movements from the beginning of English literature to the present.
Also offered at St. Jerome's College.

Engl 410  Y  1.0  The Augustan Age
A study of English literature from 1660 to 1798: the comedy of the Restoration; satire of Dryden, Swift, and Pope; the probing of mores and manners by Pope and Johnson; the emergence of the novel with Richardson, Fielding, and Sterne; and the transformation from classicism to romanticism.
Also offered at St. Jerome's College.

Engl 410A F  0.5  Satire and Sense: The Restoration and Early Eighteenth 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.
Also offered at St. Jerome's College.

Engl 410B W  0.5  Sense and Sensibility: The Middle and Later Eighteenth 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 classicism to romanticism.
Also offered at St. Jerome's College.

Engl 415  0.5  Major Canadian Writers
An intensive study of the work of two or three major Canadian authors. Writers who may be studied include Morley Callaghan, F. P. Grove, Robertson Davies, A. M. Klein, Thomas Haliburton, Irving Layton, Margaret Atwood, and Margaret Laurence.
Prereq: Consent of instructor.

Engl 430  Y  1.0  The Romantic Movement
An historical and critical study of the principles and practice of the English Romantic authors from Blake to Keats, with primary emphasis on poetry.
Also offered at St. Jerome's College.
Course Descriptions
English
Environmental Studies

Engl 430A 0.5
The Romantic Movement 1
The poetry and critical theory of Blake, Wordsworth, and Colerige. Emphasis is primarily on poetry; selected minor writers may be considered. Also offered at St. Jerome's College.

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. Also offered at St. Jerome's College.

Engl 451 A 1.0
Literature of the Victorian Age 1
An historical and critical study with emphasis on the major poets (Browning, Tennyson, Arnold), novelists (Dickens, Thackeray, Eliot), and essayists (Newman, Ruskin, Mill, Huxley). Provision will be made for students who wish to study other writers such as Hopkins, Swinburne, Carroll, Morris, or Pater. Also offered at St. Jerome's College.

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). Also offered at St. Jerome's College.

Engl 460 Y 1.0
British Literature from Shaw to Eliot
A study of the major writers in British Literature from 1885 to World War 2, with special emphasis on such writers as Shaw, Yeats, Eliot, Conrad, Joyce, and Lawrence. Also offered at St. Jerome's College.

Engl 460A F 0.5
British Literature, 1885-1914
A study of works by such writers as Shaw, Conrad, and Yeats. Also offered at St. Jerome's College.

Engl 460B W 0.5
British Literature, 1914-1945
A study of works by such writers as James Joyce, D. H. Lawrence, and T. S. Eliot. Also offered at St. Jerome's College.

Engl 495 1.0
Supervision of Senior Honours Essay

Faculty of Environmental Studies

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 Man-Environment Studies, and School of Urban and Regional Planning. The courses are of general interest and are open to all students in the University. There is no 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.

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:

Professor
C. K. Knapper1, BA Hons (Sheffield), PhD (Sask.) (on Sabbatical Leave 1981-82)
P. H. Nash, BA, MA (UCLA), CE (Grenoble), MCP, MPA, PhD (Harvard), MCIP

Associate Professor
D. Estrin2, BA, LLB (Alberta) (part-time)
R. T. Newkirk3, DA, MSc, PhD (W. Ont.)
D. H. Wood4, BComm, LLB (Toronto) (part-time)

Assistant Professor, In-Career Development Officer
M. E. Haight5, BSc, MSc, PhD (McMaster)

Adjunct Professor
M. M. R. Freeman, BSc (Reading), PhD (McGill)

Adjunct Lecturers
K. Elliott, Diploma Creative Arts
D. G. E. Wicken, Diploma AA

Faculty members with cross and/or joint appointments as shown:
1Environmental Studies and Psychology
2Environmental Studies and Planning
3Environmental Studies and Man-Environment Studies
Course Descriptions

Env S 111 F 3C 0.5
Introduction to the Study of the Future
Non-technical survey of current approaches to thinking about and refining your views of the "Future". The role of images and scenarios, contributions of the arts and concepts of space and time. Impacts of regional science, ekistics, bioethics, synergetics, and prognostics. Paths to "inventing" the future and the comprehensive design of "optimum" environments.
No prereq.

Env S 195A F,W 3C 0.5
Introduction to Environmental Studies
Theories, methods and conceptual approaches that have become associated with the study of environment are introduced. This course attempts to develop an understanding of the relationship between people and their environment and an appreciation of how we do and how we could manage that relationship.
Prereq: Environmental Studies Students only.

Env S 195B F 2C,1S 0.5
Introduction to Environmental Problems
A discussion of some major environmental problems and issues such as the population explosion, the impact of urbanization of man's environment, environmental pollution, resource management, conservation, and environmental planning.

Env S 200 F,W 2C,2L 0.75
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. There are weekly field trips to study natural and disturbed ecosystems, urban and applied ecology.
Prereq: 2nd, 3rd and 4th year students only

Env S 201 F,W 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 F 1C,2L 0.5
Social Science Approaches to Environmental Problems
Research strategies for the understanding and resolving of environmental problems, based upon concepts and methods derived from the social and behavioural sciences. Emphasis is upon integrating a variety of approaches in problem-solving situations. Particular attention is given to determining the appropriate research strategies for a range of problem situations with regard to such issues as data validity and reliability, time and financial constraints, and ethical considerations.
Prereq: 2nd yr or consent of instructor.

Env S 252 F,S 3C 0.5
Media Tools for Environmental Studies
Instruction in basic black and white photography relating to photography's role as a media tool; basic darkroom functions, camera operation, composition, photographic theory, and photo essay production. Much of the course work and projects will be done outside the classroom in field situations of environmental concern using initiative in project development. Fee for basic materials $20-$30.
Prereq: Env S students; others with consent of instructors

Env S 253 W 3C 0.5
Media Tools for Environmental Studies - Advanced Level
Builds on work performed in the basic course. Photographic colour theory and practice, basic audio recording, editing and production, and presentation formats are investigated in workshop situations. A major project is developed using pre-research material assigned by the instructor. Students work in small groups to produce a slide-sound programme of environmental concern. Fee for basic materials $20-$30.
Prereq: Env S 252
Introduction to Quantitative Research Methods
An introduction to scientific method; descriptive and inferential statistics; sampling design. The course emphasizes the methodological and interpretative problems involved in using selected quantitative methods to investigate selected environmental topics.
Prereq: only for students in Environmental Studies.

Computer Programming in Environmental Studies
The course emphasizes programming skills and applications in the context of environmental problems.
Prereq: Env S 271

Behavioural Studies
Not offered 1981-82

Parkland Management
Not offered 1981-82

Environmental Pollution and Its Control
Societal trends affecting pollution generation. Chemical basis of pollutant behaviour. Specific problem areas such as municipal, industrial, and nuclear waste disposal, occupational disease, and agricultural chemicals. Some topics presented via guest lecturers or films.
No prereq.

Environmental Studies Workshop
An interdisciplinary workshop focusing upon environmental issues in a project or research format.
Prereq: 3rd and 4th year students in Environmental Studies; enrolment is by research team only with representatives from at least 3 units of the faculty (max. 7 people) and subject to selection of an advisor and a satisfactory project or research proposal.

Professional Development in Environmental Management
Those interested in qualifying for professional status and those from other related disciplines such as civil engineering, planning, architecture, and geography may find a discussion of professional environmental management strategies useful. Issues of technical principles, data assessment, ethics, interdisciplinary work and costs will be discussed.
Prereq: 4th year students or consent of instructor

Environmental Law
An advanced, in-depth version of Env S 201, providing an opportunity for detailed analysis of institutional factors regulating the natural environment and resources development in Ontario and Canada. How satisfactory present statutes, court systems and boards are for improving environmental quality as well as alternatives to these legal-institutional approaches will be discussed.
Prereq: Env S 201

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 boards, municipal councils, the Ontario Municipal Board, the Ministry of Housing, provincial Cabinet and the Niagara Escarpment Commission in the planning process will be discussed.
Prereq: Env S 201

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 Jouvenal, Dror, Doxiadis, Ehrlich, Forrester, Fuller, Kahn, Mead, Meadows, McHale, Michael, Polak, Theobald, Thompson, Toynbee, and Ward.
Prereq: 3rd or 4th year standing or consent of instructor

Alternative Future Environments 2
Examination of "issues" in futuristics and their "methodological" problems, with particular attention to resources utilization. Socio-Cultural Change Theory and Policy Science. Science Fiction, Extrapolation, and Technology Forecasting. Societal Indicators, Quality of Life, and Technology Assessment. Probable and Possible Urban Futures. Prereq: Env S 411 or consent of instructor.

Land Use History and Landscape Change 1
Literature, theory and method relating to man's effects on landscapes and eco-systems. A human ecological approach. Case studies and field work.
Prereq: Consent of Instructor
Env S 418  W  3S  0.5  
Land Use History and Landscape Change

Research on literature, theory and method relating to man’s effects on landscapes and eco-systems. 
Prereq: Env S 417 and consent of instructor

Env S 444  F  3C,2L  1.0  
Land Evaluation and Resources Management

The course will focus on the management of land and resources. It will emphasize the techniques of inventory, critical evaluation, and policy formulation related to sensible use of these commodities. Attitudinal, legal, and political influences will be investigated, particularly as they affect the design and implementation of planning decisions.

Department of Fine Arts

Associate Professor, Chairman
N. L. Patterson, BA (Washington)

Professors
V. Burnett, BS (Columbia), MA (California)
A. M. Urquhart, BFA (Buffalo)

Associate Professor
D. I. MacKay, BFA (Mt. Allison), MFA (Cornell)

Assistant Professors
A. Green, BFA (Art Instit. of Chicago)
B. Irland, BFA (Illinois), MFA (Massachusetts)
E. Klimar, A. PhD (Toronto)
A. Rot, A. (Guelph), MA (Claremont)
J. Urquhart, A. Phye’s University Brno, 
Czech, MFA (Waterloo)

Course Descriptions

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 120  F  6std  0.5  
Fundamentals of Visual Art 1
An introduction to the fundamental principles and concepts of visual art, through a series of experimental studio problems in two and three dimensional materials and media. 
Lab fee.

Fine 121  W  6std  0.5  
Fundamentals of Visual Art 2
A continuation of Fine 120 with emphasis on colour 
Prereq: Fine 120

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.
Course Descriptions
Fine Arts

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 Renaissance Art 1
A survey of painting, sculpture, and architecture, especially in Florence and Siena, starting with Giotto and his contemporaries and covering innovations in perspective, anatomy, and iconography through the end of the 15th century.

Fine 213 W 3C 0.5
Italian Renaissance Art 2
A continuation of Fine 212 starting with the masters of the High Renaissance, Leonardo, Raphael and Michelangelo, and proceeding through Mannerism, Baroque and Rococo in Florence, Venice and Rome.

Fine 216 0.5
Northern Renaissance and Baroque Art 1400-1700
Offered in Alternate Years.

Fine 217 F 3C 0.5
Medieval Art and Architecture 400 A.D. - 1400 A.D.
A survey that begins with the paintings of the catacombs and ends with late Gothic book illumination.
Prereq: Fine 111 or consent of instructor.

Fine 218 0.5
Western Religious Art
Admission by consent of instructor

Fine 220 F 6std 0.5
Fundamentals of Painting 1
An exploration of the problems and possibilities of painting as a vehicle for serious creative expression. The fundamentals of composition and painting techniques will be presented through a series of studio projects. Lab fee.
Prereq: Fine 120/121 or consent of instructor.

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. Lab fee.
Prereq: Fine 120/121.

Fine 221 W 6std 0.5
Fundamentals of Painting 2
A continuation of the studio project begun in Fine Arts 220 with a greater emphasis on the development of individual expression. Lab fee.
Prereq: Fine 220 or consent of instructor

Fine 222 F 6std 0.5
Fundamentals of Sculpture 1
An introduction to clay sculpture. Three-dimensional form will be explored with the emphasis on the handling of clay as an expressive medium enhanced by surface treatment. Primitive reduction and Raku firing methods will be used to understand basic clay and glaze reactions to heat. Lab fee.
Prereq: Fine 120/121.

Fine 223 W 6std 0.5
Fundamentals of Sculpture 2
An introduction to multi-media sculpture. Additive and subtractive use of wood, metal and plaster casting, together with a mastery of three-dimensional forms in a variety of media. Lab fee.
Prereq: Fine 222.

Fine 223A W 6std 0.5
Clay Studies from the Human Form
Three dimensional studies from the model. Hollow fired, terra-cotta portraiture and cement fondu casting of the human figure. Lab fee.
Prereq: consent of instructor.

Fine 224 F,W 4std 0.5
Introduction to Drawing
Half the time will be devoted to drawing from the model and the remainder to a series of drawing concepts. At least one field trip will be included: Art Gallery of Ontario or the Albright Knox in Buffalo. Lab fee.
Prereq: Fine 120/121.

Fine 225 W 6std 0.5
Analytical Figure Drawing
Analytical figure drawing from the model will be combined with a study of human anatomy for artists. Lab fee.
Prereq: Fine 120/121.

Fine 226
Printmaking
Introduction to materials and methods of printmaking. Current offerings are given below.

Fine 226A F 4std 0.5
Printmaking (Intaglio)
An introduction to basic intaglio techniques including etching and engraving through workshops, class demonstrations and field trips. Lab fee.
Prereq: Fine 120/121 or consent of instructor.
Fine 226B 0.5
Printmaking (Relief)
Offered in Alternate Years

Fine 226C W 6std 0.5
Printmaking (Screen)
An introduction to screen printing, with emphasis on exploration of ink properties and stencil techniques. Lab fee.
Prereq: Fine 120/121 or consent of instructor.

Fine 227 W 3std 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 228D W 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 232W 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 233W 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 232W, any other film course or consent of instructor.
This is a WLU course for Film Studies Majors/Minors only.

Fine 242F F 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 244 F D,C 0.5
History of Film 1
General history of world cinema in its silent era (1895-1929), covering the work of outstanding directors, important movements and the contribution to the film medium as an independent art form. (Regular screening of a variety of films.) Film fee.

Fine 245 W D,C 0.5
History of Film 2 - Sound Film
A continuation of Fine 244. The expression of film history into the sound era (since 1929) including the most recent period. (Regular screening of a variety of films). Film fee.
Admission by consent of instructor.

Fine 246 F 2C,1D 0.5
Religion and Film 1 (Religious Studies 266R)
A theological approach to the study of film as a world-transforming phenomenon for man. An assessment of film's special characteristics as an art form capable of addressing man's quest for a significant existence. Consideration of a wide range of films and directors, with particular emphasis on Ingmar Bergman. Film fee $5.00.

Fine 247 W,S 2C,1D 0.5
Religion in Film 2 (Religious Studies 267R)
An exploration of selected themes - death, evil, guilt, fate, alienation, love, redemption - in the films of several of today's leading directors: Bunuel, Pasolini, Kurosawa, Fellini, Antonioni, Polanski. Film fee $5.00.

Fine 248R S,F 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 310 3C 0.5
Greek Art and Architecture (C Civ 351)
A survey of the art and architecture of the ancient Greek world from the Minoan to the Hellenistic periods.
Consult Classical Studies.

Fine 311 3C 0.5
Roman Art and Architecture (C Civ 352)
A survey of the art and architecture of the Roman world from Etruscan to Imperial times.
Consult Classical Studies.
Fine 313  W  3C  0.5  
**Special Topics in 19th Century Art**
An in-depth study with particular emphasis on the character of Neoclassic, Romantic and Realist art. Honours Arts History majors interested in 19th century are encouraged to use the course as preparation for their 4th year Honours presentation. **Prereq: Fine 210 or consent of instructor.**

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 317  W  3C  0.5  
**Canadian Art**
An examination of Canadian Art extending through the important styles of settlers, especially from Britain and France, in the seventeenth, eighteenth and nineteenth centuries, to the development of the nationalist styles of early twentieth century, culminating in contemporary Canadian art.

Fine 318  0.5  
**Canadian Ethnic and Traditional Arts**
*Admission by consent of Instructor.*

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. **No prerequisite.**

Fine 319A  0.5  
**Special Topics in 20th Century Art: 1900-1940**
*Offered in Alternate Years.*

Fine 319B  F  3C  0.5  
**Special Topics in 20th Century Art: 1940-1970**
A survey of the major movements during the thirty year period following the beginning of World War II, including Op Art, Action Painting, the Beat Consciousness, Happenings, Pop Art, Assemblage, Post-Painterly Abstraction and Field Painting, and Kinetic and Light Sculpture.

Fine 320  F  6std  0.5  
**Advanced Painting 1**
Drawing upon the experience gained in Fine 220/221 this course will emphasize the student's Individual development as a beginning painter, through independent problems, along with class discussions and individual critiques. **Lab fee.**
*Prereq: Fine 220/221 or consent of instructor.*

Fine 321  W  6std  0.5  
**Advanced Painting**
A continuation of Fine Arts 320 with a further emphasis on independent problems. **Lab fee.**
*Prereq: Fine 320 or consent of instructor.*

Fine 322  F  6std  0.5  
**Advanced Sculpture 1**
An exploration of sculpture problems in a variety of media as vehicles for serious creative expression. Wood, metal, glass and soapstone will be used for visual portrayal of spatial ideas. **Lab fee.**
*Prereq: Fine 222/223.*

Fine 323  W  6std  0.5  
**Advanced Sculpture 2**
Organization and integration of sculptural concepts in clay to develop a series of representational or abstract sculptures. Clay and glaze technology for oxidation stoneware firing will be stressed. **Prereq: Fine 322.**

Fine 323A  W  S, 6std  0.5  
**Assemblage**
A two and three dimensional study of the various aspects of assemblage, including visual poetry, processes, events, conceptualization, and structuralism.

Fine 324  F  6std  0.5  
**Advanced Drawing**
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. **Lab fee.**
*Prereq: Fine Arts 224 or consent of Instructor.*

Fine 325  W  6std  0.5  
**Advanced Drawing 2**
Continuation of Fine 324.

Fine 326A  W  std  0.5  
**Advanced Printmaking**
A continuation of printmaking concepts for independent study. **Lab fee.**
*Admission by permission of instructor.*
Fine 328 W 3std 0.5
\textbf{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 including Roman, Uncial, Gothic, Italic and Fraktur.

Fine 329 F 3std, C 0.5
\textbf{Illustration}
Studio work in techniques and theory of book illustration, together with slide lectures on the history of printed forms.
\textit{Prereq: Consent of Instructor.}

Fine 344A F 3D, C 0.5
\textbf{Topics in European Film History 1}
The classical period of French film (the 1940's and 50's). It will incorporate discussions of filmmakers such as Jean Renoir, Max Ophüls, Jean Cocteau, Marcel Carné, René Clément, Claude Autant-Lara, Jacques Becker, Jacques Tati, Robert Bresson. \textit{Film fee.}
\textit{Prereq: Another film course or consent of instructor.}

Fine 345A W 3D, C 0.5
\textbf{Topics in European Film History 2}
A study of well known international phenomenon of "new wave". It will deal with the works of cineastes like Jean-Luc Godard, Eric Rohmer, François Truffaut, Claude Chabrol, Louis Malle, Alain Resnais, Claude Lelouch, Pierre Etaix, Jacques Rivette, and Agnès Varda. It will also study the influence of the "new wave" movement on other filmmakers during the 1960's. \textit{Film fee.}
\textit{Prereq: Another film course or consent of instructor.}

Fine 346R/347R 0.5/0.5
\textbf{Special Topics in Film}
Special topics will be announced from year to year.

Fine 370 \textit{Film Theory 1 (Motion Picture Language)}
\textit{Alternates with Fine 344A}
\textit{Not offered in 1981-82}

Fine 371 \textit{Film Theory 2 (Motion Picture Theories)}
\textit{Alternates with Fine 345A}
\textit{Not offered in 1981-82}

Fine 390 F R 0.5
\textbf{Selected Subjects in Fine Arts}
Research and reading courses under the direction of individual instructors.
\textit{Admission by consent of Instructor.}

Fine 390A F 3S 0.5
\textbf{Methods in the History of Art}
For students planning a Senior Honours Presentation in Art History as it is currently understood. Students will examine methods of formal and stylistic analysis, iconographical interpretation and the application of social and political history to understanding of works of art. Required of all art history majors who take Fine 490/491.
\textit{Prereq: Consent of instructor.}

Fine 391 W R 0.5
\textbf{Selected Subjects in Fine Arts}
Research and reading courses under the direction of individual instructors.
\textit{Admission by consent of instructor.}

Fine 392 F R, std 0.5
\textbf{Selected Subjects in Fine Arts}
Studio and practice courses under the direction of individual instructors.
\textit{Admission by consent of instructor.}

Fine 393 W R, std 0.5
\textbf{Selected Subjects in Fine Arts}
Studio and practice courses under the direction of individual instructors.
\textit{Admission by consent of Instructor.}

Fine 420 F 4std 0.5
\textbf{Senior Graphics Techniques 1}
\textit{Admission by consent of Instructor.}

Fine 421 W 4std 0.5
\textbf{Senior Graphics Techniques 2}
\textit{Admission by consent of Instructor.}

Fine 470 F 0.5
\textbf{Senior Seminar in Film Concepts 1}
\textit{Admission by consent of Instructor.}

Fine 471 F 0.5
\textbf{Senior Seminar in Film Concepts 2}
\textit{Admission by consent of Instructor.}

Fine 472 F 0.5
\textbf{Senior Seminar 1}
\textit{Admission by consent of Instructor.}
Fine 473  W  0.5  
Senior Seminar 2  
Admission by consent of Instructor.

Fine 490  F  S,std,R  0.5  
Senior Honours Presentation 1  
Each student will work under the direction of a Fine Arts faculty member on an advanced creative 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 490A  F  S,std,R  0.5  
Senior General Seminar  
As in Fine 490, each student will work under the direction of a Fine Arts faculty member on an advanced creative project, and will participate in group critiques and discussions. However, this is a one term course which will not involve an exhibition. Required of all 4 year General Fine Arts students. Admission by permission only.

Fine 491  W  S,std,R  0.5  
Senior Honours Presentation 2  
A continuation of Fine 490. Admission by permission only.

Course Descriptions  
Fine Arts  
French

Department of French

Associate Professor and Chairman of the Department  
J. R. Dugan, BA, MA (Toronto), PhD (Yale)

Professors  
A. Ages, BA (Carleton), MA, PhD (Ohio State)  
J. R. Finn, CR, BA (W. Ont.), MA (Toronto), PhD (Illinois)  
R. L. Myers, BA (W. Ont.), MA, PhD (Johns Hopkins)

Associate Professors  
P. H. Dubé, BA, MA (Toronto), PhD (Ohio State)  
W. D. Wilson, MA, PhD (Trinity College, Dublin)

Assistant Professors  
H. S. Fournier, BA (Toronto), MA, PhD (W. Ont.)  
R. J. Fournier, BA, MA, PhD (W. Ont.)  
D. W. Russell, BA, MA, PhD (Toronto)  
P. Socken, BA (Toronto), MA (Iowa), PhD (Toronto)

Sessional Appointments  
C. A. Abbott, BA, MA, PhD (Ohio State)  
M. Hennig, BA (W. Ont.), MA (Waterloo)

Co-ordinators  
M. Levert-Phillips, BA en Péd. (Québec), BA (Montréal), MA (Waterloo)  
N. Vassiliadis, Baccalauréat é d Arts, Licence é s Lettres (Laval), MA (Toronto)

Waterloo at Laval  
There is an arrangement between the Department and the Université Laval, at Québec, whereby Waterloo students may study for a year or a term at Laval. Further particulars may be obtained from the Department.

First-Year French Courses  
Students should read the following carefully in order to enrol initially in the appropriate course. When in doubt, consult the Department.

Level 1: Courses for Students Who have not Completed High School Grade 13 French  
Fr 151  F,W,S  3C,1L  0.5  
Basic French  
An elementary French language course designed to give a comprehensive approach to French language study to the student who does not have the equivalent of High School Grade 13 French. Involves reading, writing and speaking French. Successful completion of Fr 151 qualifies a student to take Fr 152.
Note
Students will be placed into sections appropriate to their ability and background in French. Also offered at St. Jerome's College.

Fr 152 F,W,S 3C,1L 0.5
Basic French
A continuation of the work done in Fr 151. Successful completion of Fr 152 qualifies a student to take Fr 192.
Prereq: Fr 151 or consent of Department. Also offered at St. Jerome's College.

Note
Students completing Fr 152 with high standing may petition the Department for admission into the General French or Honours French Degree programmes.

French for Reading Knowledge
Fr 198 F 3C,1L 0.5
Reading French (Formerly Fr 101)
An elementary course, taught in English, designed to give the student a rapid and adequate reading knowledge of French. Basic elements of French sentence structure are explained, and reading passages from diverse academic disciplines are studied. This course will not give the student training in oral French.
Prereq: Consent of Department

Note
This course is intended for students who have never had French before. Students must have an adequate knowledge of the English language to enrol in this course.

Fr 199 W 3C,1L 0.5
Reading French (Formerly Fr 102)
A continuation and completion of the work begun in French 198 (formerly Fr 101).
Prereq: Fr 198, Fr 101 or consent of Department.

Note 1
This course is intended for students who have never had French before. Students must have an adequate knowledge of the English language to enrol in this course.

Note 2
There is no follow-up to Fr 199. Students wishing a basic French course leading to further courses should see Fr 151 and Fr 152.

Note 3
Successful completion of Fr 199 will satisfy the "reading knowledge of French" requirement of the University of Waterloo Graduate programmes.

Level 2: Courses for students who normally have completed High School Grade 13 French, or who have otherwise acquired an equivalent command of French.

Note 1
Students wishing to enrol in these courses will be required to take the French Language Placement Test administered by the Department at the beginning of the Fall term. *(See note below.)

Note 2
Successful completion of Fr 192 or Fr 192B or Fr 196 automatically entitles the student to register in the General or Honours Degree programmes in French.

Fr 192 Y 4C,1L 1.0
French Language
A very intensive French language course, taught in French. Emphasis will be placed on strengthening oral expression, comprehension of spoken French, reading and writing skills. Taught in French.
Prereq: Grade 13 French, Fr 152 or consent of Department. Also offered at St. Jerome's College.

Fr 192A F 4C,1L 0.5
French Language
Fall term of Fr 192; see note below.

Fr 192B W 4C,1L 0.5
French Language
Winter term of Fr 192; see note below

Note 1
These term courses are available only to students in the co-operative System or with the permission of the Department.

Note 2
Students taking Fr 192 or Fr 192A/Fr 192B who wish to major or honour in French are strongly urged to enrol in Fr 195/196 as well.

Fr 195 F 3C 0.5
French Literature
A study of various critical approaches and their application to French literature, with emphasis on the literature of French Canada. Taught in French.
Prereq: Grade 13 French or equivalent, Fr 152 or consent of Department.

Note
Students taking this course who wish to major or honour in French are strongly urged to enrol in Fr 192 as well.
Fr 196 W 3C 0.5  
French Literature II  
A study of various critical approaches and their application to French literature, with emphasis on the literature of France. A continuation of French 195. Taught in French.  
Prereq: Fr 195 or consent of Department.

Note  
Students taking this course who wish to major or honour in French are strongly urged to enrol in Fr 192 as well.

**The French Language Placement Test is designed to assist the students to find the French language course level best suited to their needs. The Department reserves the right to refuse admission to any of its language courses on any level to a student who has, in the Department's view, attained a level of competence either inferior to or superior to the levels of competence outlined in each course description. In order to permit proper evaluation of performance in the French Language Placement Test, the Department reserves the right to delay as necessary the commencement of classroom instruction.

Second-Year French Courses

Language

Fr 205 F,W 3C,1L 0.5  
Spoken French  
Intensive oral and aural training in the classroom. There will be particular emphasis on comprehension and conversation, with the class being divided into small groups for practice in speaking. These groups will be streamed according to the fluency of the students.  
Prereq: normally one of: Fr 152, 191, 192, 192B, 196, or consent of Department.

Fr 206 W,S 3C,1L 0.5  
Spoken French  
Continuation and completion of work begun in Fr 205.  
Prereq: Fr 205 or consent of Department.

Fr 207 F,S 3C,1L 0.5  
Spoken French  
Advanced level for continued intensive oral and aural training in the classroom. There will be particular emphasis on comprehension and conversation, with the class being divided into small groups for practice in speaking.  
Prereq: Fr 206 or consent of Department.

Fr 208 W 3C,1L 0.5  
Spoken French  
Continuation and completion of work begun in Fr 207.  
Prereq: Fr 207 or consent of Department.

Note 1  
Each classroom section of this course will be limited to a maximum enrolment of 12 students.

Note 2  
Students registered in the General French or Honours French Degree programmes may include this course as one of their non-French electives (regardless of the number of times they may repeat). They may not count this course as one of the French courses required to complete their degree.

Fr 210 W 2C 0.5  
Report Writing in French  
This course is designed to give students practice in the research, the organization and the writing of a variety of reports in the French language.  
Prereq: Fr 191, 192, 196 or consent of Department.

Fr 250 Y 3C,1L 1.0  
French Language  
Continued training in spoken and written French, with a concentration on more difficult problems of the language. Taught in French.  
Prereq: Fr 191, 192, 196, or consent of Department.

Fr 251 F 3C,1L 0.5  
French Language  
Fall term of Fr 250; see note below

Fr 252 W 3C,1L 0.5  
French Language  
Winter term of Fr 250; see note below.

Note  
These term courses are available only to students in the co-operative system or with the permission of the Department.

Fr 255 F 2C,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 191, 192, 196, or consent of Department.
Note
A student registered in the General French or Honours French degree programmes may include this course as a non-French elective. This course may not be counted as one of the French courses required to complete the major.

Literature
Fr 231 F 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 191, 192, 196, or consent of Department.

Fr 232 W 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 191, 192, 196, or consent of Department.

Fr 253 F 3C 0.5
Survey of Nineteenth Century French Literature
This course will trace the development of French literature from the French Revolution to the end of the nineteenth century. Taught in French.
Prereq: Fr 191, 192, 196, or consent of Department.

Fr 254 W 3C 0.5
Topics and Problems in Nineteenth Century French Literature
This course will study in depth one genre of the nineteenth century. Taught in French.
Prereq: Fr 191, 192, 196, or consent of Department.

Fr 273 F 3C 0.5
Aspects of Québec
A presentation of traditional and contemporary Québec in the fields of the Arts, literature, music, politics and society. Taught in French.
Prereq: Fr 191, 192, 196, or consent of Department.

Fr 274 W 3C 0.5
Survey of French-Canadian Literature
This course will trace the development of French-Canadian literature from its origins to the present. Taught in French.
Prereq: Fr 191, 192, 196, or consent of Department.

Fr 291 F 3C 0.5
French and French-Canadian Civilization 1
This course traces the cultural development of France and Québec from their origins 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.

Note
This course will be taught in English. It is open to Arts students in second year and higher, and to others in any year. Open to students majoring or honouring in French only with the permission of the Department.

Fr 292 W 3C 0.5
French and French-Canadian Civilization 2
This course completes the study of the cultural development of France and French Canada 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.

Note
See note under Fr 291.

Advanced Level French Courses
Language
Fr 300 Y 3C,1L 1.0
French Language
Advanced grammar and composition, including translation; oral practice and corrective phonetics. Taught in French.
Prereq: Fr 250, Fr 252 or consent of Department.

Fr 301 F 3C,1L 0.5
French Language
Fall term of Fr 300; see note below.

Fr 302 W 3C,1L 0.5
French Language
Winter term of Fr 300; see note below.

Note
These term courses are available only to students in the co-operative system or with the permission of the Department.

Fr 310 F 2C 0.5
French for Accounting
This course will provide students with the vocabulary, style and syntax to carry on basic accounting in French.
Prereq: Fr 191, 192, 196, or consent of Department.

Fr 311 W 2C 0.5
Legal French
This course will provide students with the vocabulary, style and syntax required to understand as well as to write legal documents in French.
Prereq: Fr 191, 192, 196, or consent of Department.
Fr 401 F 0.5
Advanced Language Study
Consult the Department for further details of this course.
Prereq: Fr 300, Fr 302 or consent of Department.

Fr 402 W 0.5
Advanced Language Study
Consult the Department for further details of this course.
Prereq: Fr 401 or consent of Department.

Fr 501 F 0.5
Problems of the French Language
Advanced training in stylistics and in problems of translation. Admission to the course by permission of the Department only.

Fr 502 W 0.5
Problems of the French Language
Advanced training in stylistics and in problems of translation. A continuation of Fr 501. Admission to the course by permission of the Department only.

Literature Courses

Period Numbering System
Fr 409-419 Medieval Language or Literature
Fr 420-429 Renaissance Literature
Fr 230-239, 330-339, 430-439 17th Century French Literature
Fr 340-349, 440-449 18th Century French Literature
Fr 253-259, 350-359, 450-459 19th Century French Literature
Fr 360-369, 460-469 20th Century French Literature
Fr 270-279, 370-379, 470-479 French-Canadian Literature

Note 1
Please refer to the degree requirements outlined in the Faculty of Arts Programme Section, Chapter 7.

Note 2
Students registered in the General French degree programme must complete one term course in at least three of the areas listed above, as well as Fr 300 or its equivalent.

Note 3
Students registered in the Honours French or Honours French (Applied Studies Co-op) degree programmes must complete one term course in at least six of the areas listed above, as well as Fr 401/ Fr 402 or their equivalent.

Note 4
Students registered in a Joint Honours programme combining French with another subject must complete one half-credit in at least five of the above areas, as well as Fr 401/ Fr 402 or their equivalent.

Fr 342 F 3C 0.5
Survey of Eighteenth Century French Literature
This course will trace the development of French literature from 1700-1800. Taught in French.

Fr 343 W 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.

Fr 363 F 3C 0.5
Survey of Twentieth Century French Literature
This course will trace the development of French literature from 1900 to the present. Taught in French.

Fr 364 W 3C 0.5
Topics and Problems in Twentieth Century French Literature
A more detailed study of one or more aspects of the modern period. Taught in French.

Fr 375 W 3C 0.5
Contemporary French-Canadian Novel
A study of a limited number of texts by authors such as Gabrielle Roy; Anne Hébert; Jacques Godbout; André Lagend; Hubert Aquin; Gérard Bessette. Taught in French.

Fr 409 F 3C 0.5
Medieval French Language
Introduction to the early development of French. Offered at St. Jerome's College.

Fr 410 W 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.

Fr 421 0.5
French Prose of the Renaissance
Readings in sixteenth century literature; Rabelais, Montaignt, etc. Not offered 1981-82.
**Course Descriptions**

**French**

**General Engineering**

Fr 422  W  3C  0.5  
**French Poetry of the Renaissance**  
Readings in sixteenth century poetry: Marot, Ronsard, DuBellay, the baroque poets, etc. Taught in French.

Fr 451  0.5  
**Movements and Themes in Nineteenth Century Poetry**  
A survey of lyric poetry in the nineteenth century.  
*Not offered 1981-82.*

Fr 471  W  3C  0.5  
**French-Canadian Poetry**  
A study of its evolution from Octave Crémazie to Anne Hébert. Taught in French.

Fr 472  F  3C  0.5  
**Contemporary Quebec Theatre**  
A study of the themes, structures and evolution of contemporary Quebec theatre, based on the principal plays of authors such as Gratien Gélinas; Marcel Dubé; Yves Thériault; François Loranger; Anne Hébert; Jacques Ferron; Jacques Langirand; Michel Tremblay. Taught in French.

Fr 481  F  3C  0.5  
**French Theatre**  
Each year this course will focus on a different aspect of French theatre either through a chronological or thematic approach. French dramatic theory will also be analyzed. Taught in French.

Fr 482  F  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 literary qualities. Taught in French.

Fr 483  W  3C  0.5  
**Literary Criticism**  
A study of the major trends in French literary criticism. Nineteenth century critics such as Taine and Sainte-Beuve will be analyzed. Twentieth century theories such as the *nouvelle critique* will also be explored. Taught in French.

Fr 490-498  0.5  
**Senior Tutorials**  
By arrangement with the Department, an individual student or a small group of students follows a course of study under the supervision of a faculty member.

---

**General Engineering**

Instructor  
J. Lowe, BSc (Carleton) Recipient of the Distinguished Teacher Award

**Course Descriptions**

**Gen E 010  F,W  1S  0.0**  
**Co-ordination Orientation**  
Given by the Department of Co-ordination for students in Year 1 Engineering. Its purpose is to introduce the students to the various features of the co-operative programme and engineering as a profession.

**Gen E 061  F,W  3C  0.5**  
**History and Philosophy of Science**  
The major conceptual transformations in evolution of science and technology: Greek, modern classical, contemporary periods. Scientific technology as a determining characteristic of global civilization and some critical questions it poses.  
*Not open to Year 1 students.*

**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 1 students.*

**Gen E 114  W,S  1C,3L  0.25**  
**Application of Mathematics to Engineering Problems**  
A laboratory and problems course giving practice in the mathematical formulation and solution of elementary engineering problems.  
*Prereq: Math 110A and Math 114 or equivalent.*
Engineering Concepts I
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.

Digital Computation
Introduction to electronic digital computers, hardware and software organization; basic features of FORTRAN IV; examples of efficient numerical algorithms for basic scientific computations.

Electricity and Magnetism
Introduction to fundamentals of electromagnetics, circuits, wave motion and propagation.

Department of Geography

Associate Professor, Chairman of the Department
C. R. Bryant, BA, PhD (London)

Professor, Associate Chairman
R. E. Preston, BA (Central Washington), MA (Washington), PhD (Clark)

Professor, President of the University
B. C. Matthews, BSA (Toronto), AM (Missouri), PhD (Cornell)

Professor, Dean of Environmental Studies
J. G. Nelson, BA (McMaster), MA (Colorado), PhD (Johns Hopkins)

Professor, Associate Dean
(Environmental Studies Undergraduate Affairs)
J. S. Gardner, BSc (Alberta), MSc, PhD (McGill), Recipient of the Distinguished Teacher Award

Associate Professor, Associate Dean
(Environmental Studies Special Programmes)
D. F. Walker, BSc (London), MA, PhD (Toronto)

Assistant Professor, Graduate Officer
E. F. LeDrew, BA (Toronto), MA, PhD (Colorado)

Assistant Professor, Undergraduate Officer
T. E. Bunting, BA (York), MA (W. Ont.), PhD (Toronto)

Professors
J. H. Bater, BA, MA (Br. Col.), PhD (London)
A. Diem, BA (Wayne State), MA (Clark), PhD (Michigan) (on Sabbatical Leave 1981-82)
D. K. Erb, BSc (W. Ont.), MA (Toronto), PhD (McGill)
R. M. Irving, BA, MA (Toronto), PhD (Minnesota)
C. K. Knapper, BA Hons. (Sheffield), PhD (Sask.) (on Sabbatical Leave 1981-82)
R. R. Krueger, BA, MA (W. Ont.), PhD (Indiana) (on Sabbatical Leave 1981-82)
W. B. Mitchell, BA, MA (Br. Col.), PhD (Liverpool)
P. H. Nash, BA, MA (California), CE (Grenoble), MCP, MPA, PhD (Harvard), AIP
L. H. Russwurm, BA, MA (W. Ont.), PhD (Illinois)
Associate Professors
R. A. Bullock, BA, MA (Belfast), PhD (London)
L. T. Guelke, BSc (Cape Town), MA (York), PhD (Toronto) (on Sabbatical Leave 1981-82)
B. Hyma, BS, MS (Madras), MA (Sheffield), PhD (Pittsburgh) (on Sabbatical Leave, Winter Term, 1982)
A. B. Kesik, MA, PhD (UMCS-Lublin, Poland)
G. R. McBoyle, BSc, PhD (Aberdeen)
A. G. McLellan, BSc, PhD (Glasgow)
G. B. Priddle, BA (W. Ont.), MA, PhD (Clark)
G. Wall, BA (Leeds), MA (Toronto), PhD (Hull)

Assistant Professors
C. Dufournaud, BA (Sir George Williams), MA (Laval), PhD (Toronto)
R. Johnston, BA, MA (Windsor), PhD (Minnesota)
E. R. Officer, BA (Br. Col.), MA (Wisconsin)

Lecturer
D. Dudycha, BA (Wat. Luth.), MA (Waterloo)

Adjunct Lecturers
G. Brannon, CC
D. I. McKenzie, BES, MA (Waterloo)

Faculty members holding cross and/or joint appointments as shown
1Geography and Earth Sciences
2Environmental Studies
3Geography and Planning
4Geography and Renison College
5Environmental Studies and Psychology
6Recreation and Geography
7Man-Environment Studies and Geography

Course Descriptions

Geog 101 F,W 2C,2L 0.75
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 the man-land theme and the location analysis theme.

Geog 102 F,W 2C,2L 0.75
Introduction to Physical Geography
Emphasis on the natural environment as an integrated system of which it is a part. Selected aspects of weather-climate, water, soils, biota, landforms along with flows of energy, water and matter and their resultant effects on the subsystems of the natural environment are studied.

Geog 110 F 2C 0.5
Introduction to the Field of Geography
The goals of this course are to introduce first year geographers to: Geography as a profession, different approaches to solving geographical problems, research report writing, and to the Geography Programme at the University of Waterloo.
Prereq: Geography Majors only or students intending to major in Geography

Env S 111 Introduction to the Study of the Future
See Env S course description, page 323.

Geog 125R Introduction to the Third World
Not offered 1981-82

Geog 126R F 3C 0.5
Development in the Third World
Case studies from selected countries of Africa, Asia and Latin America illustrate new approaches to spatial inequalities in development at local, regional and national levels. Themes include resources and regional development, education and health, agriculture and rural development, natural hazards and environment.

Geog 127 Regional Problems of Europe
Not offered 1981-82

Env S 195A Introduction to Environmental Studies
See Env S course description, page 323.

Env S 195B Introduction to Environmental Problems
See Env S course description, page 323.

Env S 200 Field Ecology
See Env S course description, page 323.

Env S 201 Introduction to Environmental and Planning Law
See Env S course description, page 323.

Geog 201 W,S 2C,2L 0.75
Some Basic Topics of Physical Geography
Further studies of energy and matter flows in the atmosphere and on the land. Specific topics include radiation, energy and circulation regimes of the earth-atmosphere system and the dynamics and morphology of earth structures, stream systems and glacial landform systems.
Prereq: Geog 102.

Env S 202 Social Science Approaches to Environmental Problems
See Env S course description, page 323.
Geog 202  F,S  3C  0.5
**Some Basic Topics of Economic and Urban Geography**
An analysis of the locational structure of economic activities in the overall context of regional development and with the use of case studies. Basic concepts and tools are explained; these are used to analyse the location structure of primary, secondary and tertiary activities.
*Prereq: A first-year human geography course.*

Geog 203  **Some Basic Topics of Cultural and Regional Geography**
Not offered 1981-82

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  W  2C,2L  0.75
**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 220  **World Regional Geography**
Not offered 1981-82

Geog 221  F,S  3C  0.5
**The United States**
Focuses on population shifts, environmental issues, and regional economic development in the context of the nation and selected regions.

Geog 225R  **Urbanization in the Third World**
Not offered 1981-82

Geog 226R  **Food and Agriculture, and Integrated Rural Development in the Third World**
Not offered 1981-82.

Geog 232  F  3C  0.5
**Geography of Population**

Geog 251  F  2C,1L  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.

Env S 252  **Media Tools for Environmental Studies**
See Env S course descriptions, page 323.

Env S 253  **Media Tools for Environmental Studies – Advanced Level**
See Env S course descriptions, page 323.

Geog 260  F,W  2C,2L  0.75
**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.

Env S 271  **Introduction to Quantitative Research Methods**
See Env S course descriptions, page 323.

Env S 272  **Computer Programming in Environmental Studies**
See Env S course descriptions, page 323.

Geog 275  F,W  2C,2L  0.75
**Introductory Air Photo Analysis and Remote Sensing**
Basic techniques of handling air photos, viewing them stereoscopically (in 3D), identifying and describing features, making measurements and general use in the broad field of geographic and environmental studies. Introduction to specialized types of air photos, satellite imagery and remote sensing techniques.
*Lab fee $10-$15.*

Geog 300  F,S  2C,4fldlab  0.75
**Geomorphology and the Southern Ontario Environment**
Emphasizes field work and field trips in exploring the evolution of S. Ontario landforms. The identification of landforms, landform assemblages and their relationship. The meaning and utility of this information in terms of the contemporary and future environment will be stressed. *Lab fee $10-$15.*
*Prereq: Geog 201, or Earth 121-122 or consent of instructor.*

Geog 301  W,S  3C  0.5
**Climatology**
*Prereq: Geog 201.*
Course Descriptions

Geography

Geog 302 F 2C,2L 0.75
Geomorphical Process
The impact of processes in landform development and modification. Techniques of measurement particularly as they show the impact of changes under different climatic conditions and processes connected with glaciation and deglaciation, and eolian, karst, coastal and fluvial landforms. 
Prereq: Geog 201 or Earth 121-122 or consent of instructor.

Geog 303 W 2C,2L 0.75
Physical Basis and the Geography of Water
Specific topics include: the earth's water balance and cycle, oceans, lakes and swamps, snow cover, ground ice, glacier ice and streams. Attention is directed to the impact of water on the earth's surface, the role of water in the earth's system, and water as a resource and hazard. Some field work.
Prereq: Geog 201 or consent of instructor.

Geog 307 F,W 2C,1D 0.5
Social Survey Techniques
Social research and the planning process; interview and self administered surveys; questionnaire design; profile data; sampling; data processing; non-survey data collection techniques; practical applications.
Prereq: Second or third year Geography students and Env S 271; other Env S students with consent of instructor.

Env S 310 Behavioural Studies
See Env S course descriptions, page 323.

Geog 311 F 3C 0.5
Regional Industrial Development
Manufacturing and transportation in the context of economic development at regional and urban scales. Aims at deepening conceptual insights and fostering appreciation of their relevance to understanding particular areas. Empirical focus on Canada and the U.K.
Prereq: Geog 202 or consent of instructor.

Geog 315 F 3C 0.5
Agricultural Geography
The geographical dimensions of agricultural systems. Issues include the diffusion of innovations, regional evolution of agricultural structure and vertical integration. Comparative study of programmes of government intervention in agriculture in Canada and Europe. Some field trips.
Prereq: Geog 202 or consent of instructor.

Geog 316 W,S 1C,2L 0.75
Multivariate Statistics
The theory and application of multivariate statistics, with particular emphasis upon the use of the computer. Same as Plan 316.
Prereq: Env S 271 or consent of instructor.

Geog 317 F 3C 0.5
Nonparametric Statistics
The theory and application of nonparametric statistics, with particular emphasis upon social science problems. Same as Plan 317.
Prereq: Env S 271 or consent of instructor

Geog 318 Spatial Analysis
Not offered 1981-82

Geog 319 F 2C,1L 0.5
Economic and Social Techniques for Regional Planning
Study and critical appraisal of a selection of descriptive and evaluative regional analysis techniques in common use. Reliability and applicability will be reviewed. Emphasis given to economic considerations of regional development. Discussion of input-output analysis; cost-benefit analysis, planning, programming and budgeting systems; and social area analysis. Same as Plan 319.
Prereq: Econ 101, 102 or consent of instructor.

Geog 322 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 323 Comparative Regional Problems
Not offered 1981-82

Geog 325R Special Topics in Development of the Third World
Not offered 1981-82

Geog 330 Cultural Geography
Not offered 1981-82

Geog 331 W 3C 0.5
Special Topics in Cultural Geography
A detailed investigation of selected issues in man's relations with the natural environment. Given as a seminar, issues will be partially selected on the basis of the interests of participants.
Prereq: Geog 330 or consent of instructor
Geog 332 Special Topics in the Geography of Population
Not offered 1981-82.

Env S 333 Parkland Management
See Env S course descriptions, page 323.

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 Political Geography
Not offered 1981-82

Geog 349 F 3C 0.5
The City as a System 1
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.

Geog 350 F 3C 0.5
Regional Urban Systems 1
An examination of theories, models, and research procedures dealing with the growth and support of urban centres and city systems, with relationships between aspects of urbanization and regional development, with the outward growth of cities, and with analytical techniques useful in studying such topics.
Prereq: Geog 202 or Geog 251 or consent of instructor.

Geog 352 W 3C 0.5
The Rural-Urban Fringe of Canadian Cities
Study of the processes underlying the natural, economic and cultural environments of the rural-urban fringe. Emphasis will be placed on the use, ownership, development and management of land and the interrelationships between the resource base and urban demands on it.
Prereq: Geog 202.

Geog 356 F,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. Lab fee $10-$15.
Prereq: Env S 271 or consent of instructor.

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. Same as Plan 357.
Lab fee $10-$15.
Prereq: Env S 200.

Env S 358 Environmental Pollution and Its Control
See Env S course descriptions, page 323.

Geog 358 F 3C,1L 0.75
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. Lab fee $10-$15.
Prereq: Geog 356 or consent of instructor.

Geog 360 Preparation of Maps and Illustrations
Not offered 1981-82

Geog 375 F 2C,2L 0.75
Air Photo Interpretation
The principles of air photo interpretation utilizing specific criteria visible in the conventional air photo. Examples from local and foreign environments. Lab fee $10-$15.
Prereq: Geog 275 and Geog 201 or Earth Sci 121-122 or Sci 100.

Geog 376 Environmental Remote Sensing
Not offered 1981-82

Env S 380/381 Environmental Studies Workshop
See Env S course descriptions, page 323.

Geog 381 F,W 3L 0.5
The Nature of Geography
Prereq: Any three Geog credits or consent of instructor.
Geog 390  F,W,S  2S  0.5  
**Senior Honours Research Essay Proposal**
Participants are responsible for developing a research proposal under the supervision of an appropriate faculty member. Normally taken in the third year.
Prereq: Honours Geography students only; cannot be counted for credit towards a general degree.

Geog 391  F  fidlab  0.5  
**Field Research**
One week field camp session during which a specific area will be analysed from a geographic point of view. Students will be expected to undertake individual or group analysis of specific problems and must present the results in a written report.
Prereq: Third Year Honours Geography students only; cannot be counted for credit towards a general degree.
Estimated cost to student: $80-$100.

**ENV S 400  Professional Development in Environmental Management**
See Env S course descriptions, page 323.

**ENV S 401  Environmental Law**
See Env S course descriptions, page 323.

**ENV S 402  Planning Law**
See Env S course descriptions, page 323.

Geog 400  W  2C,2L  0.75  
**Climatic and Periglacial Morphology**
Characteristics of the main principles of climatic and climatogenetic geomorphology. Examination of processes and forms related to the periglacial environment.
Prereq: One of Geog 300, Geog 302 or Earth Sci 342 or consent of instructor.

Geog 401  F  3S  0.5  
**Glacial Geomorphology and Some Contemporary Applications**
Advanced study of the total effect of glaciation. Glacial and fluvioglacial deposits and depositional conditions will be analyzed. Special attention on the environmental influences of glaciation and on practical applications of glacial geomorphologists' techniques and information.
Prereq: One of Geog 300, Geog 302 or Earth 342.

Geog 403  W,S  1C,3L  0.75  
**Advanced Cartography 1**
Advanced study of numerical map analysis and computer mapping techniques.
Prereq: Geog 260, and Env S 271.

Geog 404  Advanced Cartography 2
Not offered 1981-82

Geog 406  W  2C,1L  0.5  
**Tropical Geomorphology**
Basic geomorphological concepts and their application in a tropical environment. Special emphasis on morphology and processes as related to the geological foundation.
Prereq: One of Geog 300, Geog 302, Earth 342 or consent of instructor

Geog 407  F  3C  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. There will be a $15 charge per student for field trip expenses.
Prereq: Geog 300, Geog 302, Earth 342 or consent of instructor

Geog 408  W  2C,1L  0.5  
**Special Topics in Climatology and Natural Hazards**
Special studies in economic aspects of climate; atmospheric pollution potential; perception of urban climate and air pollution; weather modification; the atmosphere as a natural resource system. Studies of natural hazards.
Prereq: Geog 301

Geog 409  F  2C,1L  0.5  
**Energy Balance Climatology**
A field and lecture course including the radiation and energy balances of various surfaces, the principles of turbulent energy exchange, and the biotic response to the energy environment. These concepts will be illustrated through the collection and examination of field data.
Prereq: Geog 102, 201 and 301.

Geog 410  W  3C  0.5  
**Recreation Geography**
The environmental implications of existing and potential recreational demands. Recreational travel, site capability, economic and ecological impact models will be considered as well as the behavioural aspects of amenity resources.
Prereq: Geog 356

Env S 411  Alternative Future Environments 1
See Env S course descriptions, page 323.
Geog 411  W,S  3C  0.5
Resource Studies
Study of natural resource problems, with particular attention upon the role of foreign investment and the global corporation in developing resources in Canada and other selected countries.
Prereq: Geog 356 or Geog 410.

Env S 412  Alternative Future Environments 2
See Env S course descriptions, page 323.

Geog 412  W  3C  0.5
Geography of Manufacturing Firms and Industries
A companion course to Geog 311. Emphasis on decision-making, multinational corporations, technological change, and analyses of the locational patterns of specific industries.
Prereq: Geog 311.

Geog 414  F  2S  0.5
Resources Management Workshop
Application of theory, methodology and techniques to research projects which focus upon natural resource management problems. Emphasizing social and economic considerations, research project will utilize individual and group approaches.
Prereq: Geog 356 and consent of instructor.

Env S 417  Land Use History and Landscape Change 1
See Env S course descriptions, page 323.

Env S 418  Land Use History and Landscape Change 2
See Env S course descriptions, page 323.

Geog 421  Europe and the Mediterranean
Not offered 1981-82

Geog 422  W,S  2S  0.5
Canada
Seminar on the geographical analysis of selected Canadian development problems. Emphasis on topics of continuing Canadian concern.
Prereq: Geog 322 or Plan 222.

Geog 423  Central and Eastern Europe
Not offered 1981-82.

Geog 424  F  3C  0.5
Soviet Union
Advanced study of selected aspects of the geography of the Soviet Union. A degree of flexibility in the course to allow some emphasis on topics of particular interest to the students registered in it.
Prereq: Geog 204

Geog 425  Africa
Not offered 1981-82

Geog 430  Field Research in Regional Geography
Not offered 1981-82

Env S 444  Land Evaluation and Resources Management
See Env S course descriptions, page 323.

Geog 448  F  2S  0.5
Urban Historical Geography
An examination of the process of city growth during the nineteenth and early twentieth centuries. The course will focus on internal urban structure and will cover both the European and North American city. Emphasis on student projects.
Prereq: Geog 349 or consent of instructor. Hist 204C recommended.

Geog 449  W  3C  0.5
The City as a System 2
Emphasis on specific types of urban sub-systems, e.g. commercial, industrial, residential; applied problems such as commercial blight, residential change, urban quality dimensions and the changing role of the public sector. Emphasis is placed on individual projects.
Prereq: Geog 349 or consent of instructor.

Geog 450  S  3C  0.5
Regional Urban Systems 2
A continuation of Geog 350 with an emphasis on student projects.
Prereq: Geog 350.

Geog 451  F,S  1C,3L  0.75
Soils Geography
Prereq: Env S 200 and Geog 315.

Geog 452  W  2S  0.5
Problems of Rural Land Use
The nature of rural land problems and a critical evaluation of the methods of rural land use planning, in both metropolitan areas and underdeveloped or depressed rural regions.
Prereq: Geog 315 and/or Geog 352

Geog 461  F  3C  0.5
Land Dereliction & Rehabilitation 1
Examination of the reasons for land dereliction, its processes, and effects. Analysis of rehabilitation techniques, includes principles of landscape architecture and optimizing ecological considerations and use of post operation areas.
Prereq: 4th year students or consent of instructor

Geog 462  Land Dereliction & Rehabilitation 2
Not offered 1981-82.
Course Descriptions
Germanic and Slavic Languages and Literatures

Geog 470  W  2C,2L  0.75
Applied Air Photo Interpretation
Advanced air photo interpretation and its application in geomorphology, geology, resources inventory, engineering soils, hydrology, and pre-planning studies (terrain analysis). Projects in specific fields of interest form a significant part of the course. Lab fee $10-$15.
Prereq: Geog 375 and Geog 300 or Geog 302 or consent of instructor.

Geog 471  S  2C,2L  0.75
Advanced Remote Sensing
The principles of earth resource analysis using remotely sensed imagery and digital data will be studied with emphasis upon satellite platform sources. The coordination of supplemental imagery and ground truth missions with satellite data will be considered in a multi-strategy perspective. Lab fee $10-$15.
Prereq: Geog 376.

Geog 475  F,W,S  2S  0.5
Special Reading and Seminar on Selected Topics
A brief outline is to be filed with the Chairman or UG officer.
Prereq: 3 full credits in Geog and consent of instructor.

Geog 476  Y  2S  1.0
Special Readings and Seminar on Selected Topics
A brief outline is to be filed with the Chairman or UG officer.
Prereq: 3 full credits in Geog and consent of instructor.

Geog 481  W  2S  0.5
Frontiers in Geography
Current philosophical and methodological trends in geographical thought. New and resurgent developments in various sub-fields and issues in related disciplines including professional planning, architecture, future studies, environmental psychology and public administration.
Prereq: Geog 381 or consent of instructor.

Geog 482 Geography and Education
Not offered 1981-82

Geog 490A  F,W,S  3S  0.5
Senior Honours Research Essay
Preparatory work and first draft of essay
Prereq: Geog 390; only fourth year Honours students.

Geog 490B  F,W,S  6S  1.0
Senior Honours Research Essay
Completed Essay.
Prereq: Geog 390 and Geog 490A; only fourth year Honours students.

Department of Germanic and Slavic Languages and Literatures

Professor, Chairman of the Department
J. W. Dyck, AB (Bethel), MA (Missouri), PhD (Michigan)

Associate Professor, Associate Chairman Graduate Studies
M. Kuxdorf, BA, MA, (Waterloo), PhD (Alberta)

Associate Professor, Associate Chairman Undergraduate Studies
F. Jakobsh, BA, MA (Manitoba), PhD (Waterloo)

Professors
E. Heier, BA, MA (Br. Col.), PhD (Michigan)
S. Hoetert, BA, MA, PhD (Toronto)

Exchange Professor - Mannheim
W. Michel, Dr.phil. (Freiburg), Dr.phil.habil. (Mannheim)

Associate Professors
G. Brude-Firmau, Staatsexamen (Berlin), PhD (Yale)
H. W. Panthel, BA (Waterloo), MA (Cincinnati), PhD (Waterloo).
M. Richter, Staatsexamen (Berlin and Bonn), MA, PhD (Toronto)
W. Shelest, MA (Ottawa), Dr. phil. (München UFU)
J. Whiton, BA, MA, PhD (Minnesota)
A. Zweers, Doctorandus (Amsterdam), litt Dr. (Groningen)

Assistant Professors
D. G. John, BA, MA, PhD (Toronto)
R. Karpik, BA, MA (Manitoba), PhD (Ottawa)
B. Kejna-Sharratt, MA (Warsaw), BA (London), MA (McMaster), PhD (Toronto)
T. Sommer, BA, MA (Waterloo)

Lecturers
S. Dyck, BA (London), MPhil (Waterloo)
B. Kaltz, Staatsexamen (Mainz)
H. Marsden, BA (Randolph-Macon), MA (Waterloo)

Mannheim Programme
The Department offers a programme of studies at the University of Mannheim in Germany, where students may obtain full credits for a year of study. For further information see p. 103 and consult the Department.
Course Descriptions

German

First Year Courses
In choosing first year courses, students should read carefully the course descriptions and differentiations:

A. GER 101/102, 105/106, 111/112 are beginners courses for students who know little or no German and are therefore not open to those with Grade 13 German or equivalent. Additional information is available on p. 000 and from the Undergraduate Officer in Department.

Ger 101 F,W,S 3C 0.5 First Year German
For students with little or no knowledge of German. The basic elements of German grammar with an emphasis on oral practice and pronunciation. Language laboratory. Introduction to aspects of German culture and reading of appropriate graded texts. One section, Ger 101A, offers more intensive oral practice with an additional language lab hour per week.

Ger 102 F,W,S,A 3C 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 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.

B. GER 121/122 and 151/152 are first year courses for students who have completed at least two years of High School German or have an equivalent background in the language. If in doubt, consult the Department.

Ger 121 F 3C 0.5 Studies in German Literature with Language Practice
An introduction to German literature designed to accomplish the transition from language studies to reading and discussing literary texts. Grammar review, conversation practice, and the reading of selected works.
Prereq: At least 2 years of High School German, or equivalent.

Ger 122 W 3C 0.5 Studies in German Literature with Language Practice
As Ger 121.
Prereq: Ger 121.

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. Language lab is recommended.
Prereq: At least 2 years of High School German, or equivalent.

Ger 152 W 3C 0.5 German Conversation and Grammar Review
As Ger 151.
Prereq: Ger 151.

Ger 201 F 3C 0.5 Second Year German
This course is a continuation of first year Ger 101/102. It offers extensive practice in both the spoken and written language. It provides vocabulary building, grammar review, and exercises in pronunciation and comprehension. Language Lab.
Prereq: Ger 102 or equivalent.

Ger 202 W 3C 0.5 Second Year German
As Ger 201.
Prereq: Ger 201.
Ger 211  F  3C  0.5  
Intermediate Scientific German  
Grammar review and more advanced study of German structure and idiom. 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.  
Prereq: Ger 106, 112 or equivalent.

Ger 212  W  3C  0.5  
Intermediate Scientific German  
As Ger 211.  
Prereq: 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. Option Language Lab.  
Prereq: Ger 122, 152 or equivalent.

Ger 252  W  3C  0.5  
German Conversation and Composition  
As Ger 251.  
Prereq: Ger 251.

Ger 261  F  3C  0.5  
The Age of Goethe (Classicism)  
Reading, interpretation, and critical analysis of representative works (Goethe, Schiller, Hölderlin, etc.)  
Prereq: Ger 122, 152 or equivalent.

Ger 262  W  3C  0.5  
The Age of Goethe (Romanticism)  
Reading, interpretation, and critical analysis of representative works (Novalis, Tieck, Brentano, etc.)  
Prereq: Ger 122, 152 or equivalent.

Ger 271  F  3C  0.5  
German Thought and Culture  
A survey of cultural currents to the time of Enlightenment. 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 Goethe 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: Brecht, Borchert, Böll, Frisch, Dürenmatt, Grass, Eich.  
Prereq: Ger 122, 152 or equivalent.

Ger 282  W  3C  0.5  
Post-War Literature  
As Ger 281.  
Prereq: Ger 122, 152 or equivalent.

Ger 291  F  3C  0.5  
Survey of German Literature  
Introduction to the major periods of German literature. Readings and interpretation of representative texts.  
Prereq: Ger 122, 152, 202 or equivalent.

Ger 292  W  3C  0.5  
Survey of German Literature  
As Ger 291.  
Prereq: Ger 122, 152 or equivalent.

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 202, 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.

Ger 361  F  3C  0.5
Young Germany and Biedermeier
Reading, interpretation, and critical analysis of prescribed prose, drama and poetry. (Grillparzer, Mörike, Stifter, Gotthelf, 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, 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 Danton's 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 395Z  F  2.5
Waterloo in Germany Programme
See page 000 for description.

Ger 396Z  W  2.5
Waterloo in Germany Programme
As 395Z.

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 332 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  W  3C  0.5
Middle High German Literature
Reading and interpretation of samples from the major works of the MHG period, with emphasis on writers of the first "Blütezeit" in German literature (1170 to 1250): Early Minnesang, Walther von der Vogelweide, Nibelungenlied, Hartmann von Aue, Wolfram von Eschenbach, etc.
Prereq: Ger 122, 152 or equivalent.
Offered in alternate years.

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.
German Poetry
A study of the main thoughts, themes, forms, and schools in German poetry from German Romanticism to the present.
Prereq: Ger 471 or equivalent.

Ger 495-498 F,W,S,M R each 0.5
Reading Courses in Approved Topics
Prereq: Fourth year students only.

Credits: 1.5 for completion of
a) first year Russian: 193, 194, 195, or
b) second year Russian: 293, 294, 295, or
c) third year Russian: 393, 394, 395, or
d) fourth year Russian: 493, 494, 495.

Note:
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
(Arts Oriented) For students with little or no knowledge of Russian. The elements of Russian grammar and composition; with emphasis on oral practice and pronunciation. Language Laboratory and Visual Aids. Selected readings of major Russian authors.
Open to all university students, except those who have credit for Russ 111/112.

Russ 102 W 3C,1L 0.5
First Year Russian
As Russ 101.
Prereq: Russ 101 or equivalent.

Russ 111 F,S,W 3C 0.5
First Year Russian
(Science Oriented) For students with little or no knowledge of Russian. Essential grammar, sentence structure. Reading and translation of scientific literature according to the students' fields of interest.
Open to all university students, except those who have credit for Russ 101/102.

Russ 112 W,F 3C 0.5
First Year Russian
As Russ 111.
Prereq: Russ 111, Russ 101 or equivalent.

Russ 201 F 3C 0.5
Intermediate Scientific Russian
A review of the fundamentals of grammar is followed by a more advanced study of the language structure and idiom. Readings and translation from contemporary scientific writing with the aim of helping the student to acquire a greater vocabulary and to master the stylistic difficulties peculiar to technical writing.
Prereq: Russ 102, 112 or equivalent.

Russ 202 W 3C 0.5
Intermediate Scientific Russian
As Russ 201.
Prereq: Russ 201 or equivalent.
Course Descriptions
Russian

Russ 251 F 3C 0.5
Conversation, Composition, Grammar and Phonetics
The course is conducted largely in Russian and provides intensive practice in spoken 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 261. 
Prereq: Russ 261 or equivalent.

Russ 271 F 3C 0.5
Russian Thought and Culture
A survey of cultural history from 862 to 1905. Lectures will focus on major developments in literature, religion, 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. 
This course is 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. 
This course is taught in English. 
Open to all students.

Note
Arts students can take Russ 271 and 272 in their second or subsequent years; students for other faculties, in any year (See Chapter 7 for course requirements in the Faculty of Arts).

Russ 281 F 3C 0.5
Russian Short Story
A study of the form and a detailed examination of Russian short stories by major representative writers. 
Conducted in English. Extra work in Russian required of Russian majors only. Open to all students.

Russ 282 W 3C 0.5
Russian Short Story
As Russ 281. 
Conducted in English. Extra work in Russian required of Russian majors only. 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 idiom 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. 
Conducted in English. Extra work in Russian required of Russian majors only. Open to all students.

Russ 342 W 3C 0.5
Russian Drama
As Russ 341. 
Conducted in English. Extra work in Russian required of Russian majors only. Open to all students.

Russ 351 F 3C 0.5
Intermediate Conversation and Composition
Written reports on prescribed themes and topics. Oral drill and translation. 
Prereq: Russ 252 or equivalent.

Russ 352 W 3C 0.5
Intermediate Conversation and Composition
As Russ 351. 
Prereq: Russ 351 or equivalent.
Course Descriptions
Russian

Russ 356 W 3C 0.5
The Stage as Forum: Russian Drama in Translation
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. The course is conducted entirely in English.
Fall term: See Ger 355.
Open to students from all departments.
Not normally open to first year students.

Russ 381 3C 0.5
The Peoples of the Soviet Union
Especially emphasized will be the study of non-Slav peoples of the Caucasus and Central Asia, European Russian and Siberia. Czarist and Soviet policy towards national minorities, assimilation and integration problems in the light of linguistic division; development of literary languages. Some achievements of Soviet anthropology.
Open to all students.

Russ 382 3C 0.5
The Peoples of the Soviet Union
As 381.
Open to all students.

Russ 391 F 3C 0.5
Great Russian Novels
Reading and interpretation of 19th century novels selected from the works of Pushkin, Lermontov, Gogol, Turgenev, and Tolstoy. Lectures on social and intellectual background. Conducted in English. Extra work in Russian required of Russian majors only.
Open to all students.

Russ 392 W 3C 0.5
Great Russian Novels
Reading and interpretation of 19th and 20th century novels selected from the works of Dostoevsky, Gorky, Pasternak, Solzhenitsyn, and Zamiatlin. Lectures on social and intellectual background. Conducted in English. Extra work in Russian required of Russian majors only.
Open to all students.

Russ 441 3C 0.5
East Slavic Epic Tradition
A study of the origins and development of the Epic tradition in East Slavic Literature.
Conducted in English. Open to all students.

Russ 442 3C 0.5
Russian Epic Tradition
As Russ 441.
Conducted in English. Open to all students.

Russ 451 F 3C 0.5
Advanced Conversation, Grammar and Composition
This course is conducted in Russian and provides intensive practice in spoken and written Russian on the advanced level.
Prereq: Russ 362 or equivalent.

Russ 452 W 3C 0.5
Advanced Conversation, Grammar and Composition
As Russ 451.
Prereq: Russ 451 or equivalent.

Russ 461 F 3C 0.5
Twentieth Century Russian Literature
Reading, interpretation, and critical analysis of selected fiction and drama (Andreev, Bunin, Gorky, Kataev, Sholokhov, A. N. Tolstoy). Conducted in English. Extra work in Russian required of Russian majors only.
Open to all students.

Russ 462 W 3C 0.5
Twentieth Century Russian Literature
Reading, interpretation, and critical analysis of selected fiction and drama (Arbusov, Bulgakov, Erenburg, Nabokov, Pasternak, Solzhenitsyn). Conducted in English. Extra work in Russian required of Russian majors only.
Open to all students.

Russ 481 F 3C 0.5
Russian Poetry
A study of themes and forms of representative authors of Classicism, Romanticism (Lomonosov, Derzhavin, Pushkin, Lermontov, Nerkrasov, Fet, Tiuchev, etc.).
Prereq: Russ 102 or equivalent.

Russ 482 W 3C 0.5
Russian Poetry
A study of themes and forms of representative authors from Symbolism to the present (Blok, Esenin, Mayakovsky, Akhmatova, etc.).
Prereq: Russ 102 or equivalent.

Russ 485 F 3C 0.5
History of Russian Literature
This course deals with the emergence of the Russian national literature, emphasizing the cultural and intellectual setting from the beginning to 1917. Literary movements and major representative works not studied in other courses will be discussed. Conducted in English. Extra work in Russian required of Russian majors only.
Open to all students.
History of Russian Literature
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. Conducted in English. Extra work in Russian required of Russian majors only. Open to all students.

Russ 496-498 F,W,S 0.5
Reading Courses in Approved Topics
Open to fourth year students only.

Polish

Polish 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. The instruction is in English. Open to all university students.

Polish 201 F 3C 0.5
Intermediate Polish
This course will be conducted largely in Polish and provides intensive practice in grammar, composition, and conversation. Prereq: Polish 102 or equivalent. Taught in alternate years.

Ukrainian

Ukrainian 101 F 3C,1L 0.5
Beginners' Ukrainian
For students with 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.

Course Descriptions

Polish

Ukr 101 W 3C 0.5

Polish 102 W 3C,1L 0.5
As Ukran 101.
Prereq: Ukran 101 or equivalent.

Ukr 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. Taught in alternate years.

Ukr 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. This course is taught in English. Open to all students.

Ukr 401 F 3C 0.5
Ukrainian Romanticism
Taras Shevchenko and his Time. Kharkov and Kiev as literary centres. Reading and critical analysis of prescribed texts (Shevchenko, Kulish, Kostomariv, etc.). Prereq: Ukran 202 or equivalent.

Ukr 402 W 3C 0.5
Ukrainian Romanticism
The literary revival in Western Ukraine. A critical study of the literary movement with special emphasis on the major authors (Shashkevych, Vahylevych, Holovats’kyj) and others. Prereq: Ukran 202 or equivalent.
Department of Health Studies

Associate Professor, Chairman of Department of Health Studies
J. A. Best, BA (Queen's), PhD (Waterloo)

Professor, Dean of the Faculty of Human Kinetics and Leisure Studies
G. S. Kenyon, BPE (Br. Col.), MS (Indiana), PhD (NYU)

Assistant Professor, Associate Dean of Undergraduate Affairs of the Faculty of Human Kinetics and Leisure Studies
R. S. McColl, BSc (McGill), PhD (Purdue)

Assistant Professor, Associate Chairman Undergraduate Affairs
D. J. Walters, BSc (Waterloo), MA (Dalhousie), MD (Queen's)

Assistant Professor, Associate Chairman Graduate Affairs
B. Flay, D. Phil (Waikato)

Associate Professors
M. T. Sharratt, BA, MA (W. Ont.), PhD (Wisconsin)
R. P. Schlegel, BA (W. Ont.), MSc (Illinois), PhD (Ohio State)

Assistant Professors
L. Hoffman-Goetz, BA (SUNY, Binghamton), MA, PhD (Michigan)
N. Kreiger, BA (Pennsylvania), MPH, PhD (Yale)
K. Prkachin, BA, MA, PhD (Br. Col.)
P. Wainwright, BSc (Rhodes, S.A.), MA, PhD (Waterloo)

Adjunct Assistant Professor
H. W. Gruchow, BSc, MSc, PhD (Wisconsin)

Research Associate
C. H. Pierce, BA (Grinnell), MA (DePauw), PhD (Kansas)

Faculty Members Holding Cross Appointment as shown:
"Department of Kinesiology

Course Descriptions

Health

Course Descriptions

Health 140 F,W 3C,1T 0.5
Introduction to Health Sciences 1
An exploration of the biological basis of health and disease, strategies for prevention and treatment of disease, and the moral, social, and psychological impact of innovations in health care on Canadian society. Topics include human reproduction, (conception, pregnancy and childbirth, sexual development and expression), human heredity (chromosomal disorders, genetic diseases, birth defects), and acute disease states (infectious diseases, cancer, immune deficiencies).

Health 141 F,W 3C,1T 0.5
Introduction to Health Sciences 2
An exploration of the biological basis of health and disease, strategies for prevention and treatment of disease, and the moral, social, and psychological impact of innovations in health care on Canadian society. Topics include the human nervous system (neurological disorders, mental illness, brain dysfunctions, drug abuse), lifestyles and health (heart disease, obesity, exercise, smoking), and health care systems (environmental health, medical abuses, aging, and dying).

Health 220 F 3C,1T 0.5
Health and the Family
The course familiarizes students with the issues involved in understanding how people live and develop within the context of families, and the family interaction with the larger social community. Special emphasis will be placed on health related concerns and the ways in which the family and health care institutions of the society contribute to the physical and emotional health of its members.
Prereq: Health 140 and 141

Health 241 W 3C 0.5
Disease Process
An introduction to the study of factors governing the occurrence of diseases in human populations, using selected diseases to illustrate disease mechanisms and identification of risk factors.
Prereq: Biol 230, 233, Kin 317 or equivalent.

Health 245 F 3C 0.5
Community Health
This course examines health care delivery systems by considering organizational principles, manpower issues, health resources and economics, service utilization and alternatives to the institutional model. 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.
Health 302  F  2C  0.5
Introduction to Biomathematics 1 (MTHEL 302a)
Biometry is a biological discipline requiring both a
knowledge of mathematics and some basic
understanding of specific biological phenomena. The
course material has been selected from genetics and
gerontology to provide examples of where both
mathematics and biology have contributed to the
advancement of knowledge in interdisciplinary areas.
Prereq: Kin 116 or first year Chemistry or consent of
instructor.

Health 303  W  2C  0.5
Introduction to Biomathematics 2 (MTHEL 302b)
A continuation of Biomathematics 1. Topics
considered are first order reaction kinetics in
biological systems including a discussion of
radioisotope and C¹⁴ dating, higher order kinetics
including statistical considerations in enzyme
kinetics, models for and the measurement of
evolution from a knowledge of genetics and protein
structure and assessing the relative importance of
environmental factors as evolutionary determinants.
Prereq: Health 302.

Health 310  W  3C  0.5
Environmental Health
A study of human biological variation in relation to
various physical, biological, and social
environmental influences, with emphasis on the
relevance of these factors to health and disease.
Prereq: Kin 317 or equivalent.

Health 344  W  3C  0.5
Programme Evaluation
A comprehensive and systematic introduction to the
key concepts, methodologies, and issues related to
programme evaluation in general and their
application to health programmes 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 programmes
will be discussed.
Prereq/Coreq: Kin 222 and Kin 330 or equivalent
basic knowledge in statistics and research
design/methodology.

Health 346  W,S  3C  0.5
Nutrition (Kin 346)
An elementary course in nutrition with special
emphasis on diet for sport and certain physiological
conditions.
Prereq: Kin 317 or equivalent.

Health 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.

Health 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.

Health 407  W  3C  0.5
Physiology of Coronary Heart Disease (Kin 407)
An examination of the pathology, risk factors and
rehabilitation programmes related to coronary heart
disease. Major emphasis is placed on the cardio-
respiratory implications of exercise in the
rehabilitation process.
Prereq: Kin 300 or permission of instructor.

Health 410  W  3C  0.5
Growth, Development and Aging (Kin 410)
The physiology of growth, development and aging is
examined with special reference to the influence of
physical activity, diet and other environmental
factors on the normal processes.
Prereq: Kin 200 and Biol 233.

Research Project
An independent research project on an approved
topic, supervised by a faculty member. Includes an
approved design and completion of the first three
chapters of the paper.
Prereq: Approval of supervisor.

Health 432  F,W,S  0.5
Research Project
An independent research project on an approved
topic, supervised by a faculty member. Includes data
collection, data analysis and presentation of results
in thesis form.
Prereq: Completion of Health 431.
Health 442  F  3C  0.5
**Epidemiology of Chronic Diseases**
An investigation of the epidemiology of selected "non-infectious" diseases. Specific disease emphasized will vary from year to year (e.g. cardiovascular diseases, malignant neoplasms at various sites; chronic diseases of respiratory and digestive systems). The course emphasizes identification of risk factors and methodology. 
Prereq: Health 241 or consent of instructor.

Health 443  W  3C  0.5
**Behavioural Strategies for the Prevention of Chronic Diseases**
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.

Health 445  W  3C  0.5
**Seminar in Health Behaviour**
A study of current issues pertaining to health and health behaviour. Topics include pertinent research in the field of health which have significant values to the individual, family and community, as well as a study of the problem areas in health behaviour.
Prereq: Health Studies students only, or permission of instructor.

Health 472  F,W,S  0.5
**Independent Study**
For the student who desires to pursue a particular topic in depth through guided independent research and/or reading. A faculty member must approve a student’s project prior to registration. May be repeated in subsequent terms.
Prereq: Consult with Department.

Department of History

Professor, Chairman of the Department
H. MacKinnon, BA (Montreal), PhL, STL (Gregorian), MA (Toronto), DPhil (Oxford)

Assistant Professor, Associate Chairman
D. E. Wright, BA (Cambridge), MA, PhD (McMaster)

Professors
P. G. Cornell, ED, MA, PhD (Toronto) FRHistS
M. J. Craton, BA (London), MA, PhD (McMaster) FRHistS
F. H. Epp, BA (Bethel College), MA, PhD (Minnesota), LLD (Brandon) G
F. C. Gérard, MA (College St. Dominique, France), BD, STM (McGill), PhD (Hartford, Conn.) P
P. Keresztes', MA (Toronto), PhD (Graz)
W. Klaassen, BA (McMaster), DPhil (Oxford) G
J. F. H. New, BA, MA (Melbourne), PhD (Toronto), FRHistS
G. M. Ostrander, BA (Columbia), MA, PhD (California-Berkeley)

Adjunct Professors (WLU and Guelph)
R. P. Fuke, BA (Toronto), MA (Maryland), PhD (Chicago), (WLU)
W. Stanford Reid, PhD (Penn.), FRHistS

Associate Professors
M. T. Cherniavsky, MA (Oxford)
D. A. Davics, BA, PhD (Washington) Recipient of the Distinguished Teacher Award
K. D. Eagles, BA (Cambridge), MA, PhD (Washington)
J. R. English, BA (Waterloo), AM, PhD (Harvard)
P. J. Harrigan, BA (Detroit), AM, PhD (Michigan)
L. A. Johnson, BA (Waterloo), MA, MPhil (Toronto)
R. C. MacGillivray, RA (Queen’s), AM, PhD (Harvard)
K. M. McLaughlin, BA (Waterloo), MA (Dalhousie), PhD (Toronto)
E. P. Patterson, BA (Bay), MA (Kansas), PhD (Washington)
P. S. Smith, MA (Toronto), PhD (New Mexico) J
J. O. Stubbs, BA (Toronto), MSc (Econ) (London), DPhil (Oxford)
J. A. Wahl, CR, BA (W. Ont.), MA, PhD (St. Louis) J
J. W. Walker, BA (Toronto), MA (Waterloo), PhD (Dalhousie)
R. E. Wynne, DJur (Vienna), BEd, MA (Alberta), PhD (Washington)
Assistant Professors
D. J. Horton, BA (Wat. Luth.), MA (Waterloo), PhD (McGill)
S. K. Johannesen, BA (Evangel College), MA, PhD (Missouri)
W. O. Packull, BA (Guelph), MA (Waterloo), PhD (Queen's)
R. Sawatsky, BChEd (CMBC), BA (Bethel College)

MA (Minnesota), MA (Princeton), PhD (Princeton) G

History Courses

100 level: Introductory courses. For First-Year Arts students and for all other students interested.

200-224: Survey courses. Primarily intended for non-history majors, but open to history majors.

250-258: 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. Restricted to senior history honours students.

Course Descriptions

Hist 100 F 0.5
Landmarks in World History
A thematic introduction to the development of the world's major civilizations. This year's theme is "Community and Social Order", examining the dynamic relationship between individuals and their social structures, and their state.
Instructors: MacKinnon, Harrigan, Davies.

Hist 101A 0.5
Major Themes of Western Civilization
The major transformations of Western Civilization from the disintegration of the Roman Empire to the emergence of modern Europe.
Offered by correspondence only: F,W,S, in 1981-82.

Hist 101B 0.5
Major Themes of Western Civilization
The major transformations of modern Western Civilization: The French and Industrial Revolutions, Nationalism, the World Wars, Fascism, Totalitarianism and other dynamic forces.
Offered by correspondence only: F,W,S, in 1981-82.

Hist 102A S 0.5
The American Identity 1807-1980
A consideration of the shaping of American characteristics under the headings of: The Frontier; Religious Denominationalism; Libertarian Revolution; Black Slavery; New Immigrations; Mass Production; the Great Depression; War and Global Americanism.
Instructor: Ostrander

Hist 102B W 0.5
Imperialism in the Twentieth Century
An introduction to the colonial experience and to the processes of national emergence in the Twentieth Century. Special reference is made to the Caribbean area.
Instructor: Craton

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.
Instructor: Stubbs.

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 Stalinism.
Instructor: Harrigan

Hist 102E F,W 0.5
Canadian History
Selected major themes from pioneer life to Canadian involvement in Twentieth Century wars.
Instructors: English, Johnson

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. Sartre, Shakespeare to Marx and Freud.
Instructor: Johannesen

Hist 102N W 0.5
The Church and Politics 1303-1414
A century of conflict: The Avignon Papacy (sometimes called the Babylonian Captivity), the Great Schism and the Conciliar Movement. A continuation of Medieval History given in History 100 and an introduction to Renaissance and Reformation history.
Instructor: MacKinnon
Hist 130  W,S  0.5
The Modern World in Historical Perspective
This course will introduce students, through the interrelationships and interaction of selected themes, to the contemporary history of Europe, North America, and the Far East. Its format includes two interpretive lectures per week plus major films on twentieth century crises and optional discussion groups.
Instructor: Eagles
This course created for non-Arts students.

Hist 200  F,W  0.5
Twentieth-Century History as Documented by Films
A history of the Twentieth Century through films. The First World War, Europe between the Wars, The Second World War, North American society in the Twentieth Century and other political, moral and social themes will be explored.
Instructor: Johannesen

Hist 201X  F  0.5
Canadian Urban History
An historical examination of the urbanization process, the social, political and economic factors that shaped the Canadian city, and the relationship between selected metropolitan and hinterland areas.
Instructor: Johnson

Hist 202X  F  0.5
The Individual and the Family in History
A survey of the changes in the quality and structure of life with special emphasis on love, marriage and the family in the West since the sixteenth century.
Instructor: Johannesen

Hist 203X  F  0.5
Modern Quebec
The course will discuss the problem of Quebec in contemporary Canada by analyzing the historical background of key issues like separatism, the survival of the French language, French-Canadian nationalism and the Quiet Revolution.
Instructor: Horton

Hist 204D  F  0.5
Church and State in Modern Latin America
An historical analysis of the role of organized religion, primarily Roman Catholicism, in modern Latin America. The relationship between Church and State will receive particular attention.
Instructor: Smith
Offered at St. Jerome's College.

Hist 204X  W  0.5
Oil and Politics in Latin America
An historical analysis of the development of Latin American oil policies and their relevance to North America. Multinational oil companies and the creation of indigenous petroleum industries will be studied.
Instructor: Smith
Offered at St. Jerome's College.

Hist 205X  W  0.5
Canadian Business History
A study of the development of business in Canada at both the general economic and the individual enterprise level.
Instructor: Johnson

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.
Instructor: Patterson

Hist 209X  0.5
20th Century America, 1898-1978
Instructor: Eagles
Offered by correspondence only: W,S, 1981-82.

Hist 210X  W  0.5
History of Law
An historical introduction to law throughout the ages: concepts, institutions, practices.
Instructor: Wahl

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.
Instructor: Cherniavsky
Hist 212 W 0.5
British History since 1603
A survey of the shaping of British society and the British experience from the time of Shakespeare to the present: constitutional conflict and compromise, rise and fall of empire, industrial and urban revolution, world wars and welfare state.
Instructor: Wright

Hist 213X Modern Western Popular Culture
Not offered 1981-82

Hist 216 S 0.5
Irish History in the Age of Unification and Revolt
Political, social and religious history of Ireland from the supremacy of the Gaelic social order to the Act of Union, 1485 to 1800.
Instructor: MacGillivray
Also offered by correspondence: F, 1981-82.

Hist 217 0.5
Irish History in the Nineteenth and Twentieth Centuries
Political, social and religious history of Ireland emphasizing social changes, the struggle for Home Rule and the Republic, 1800 to present.
Instructor: MacGillivray
Offered by correspondence only: W,S 1981-82

Hist 223 0.5
Canadian Culture and Society to 1900
An inquiry into the nature of the Canadian experience by examining concepts and themes that were significant before the Twentieth Century.
Instructor: Cornell
Offered by correspondence only: F,W,S, 1981-82

Hist 224 0.5
Canadian Culture and Society in the Twentieth Century
An approach to modern Canadian development as the people have wrestled with such phenomena as: war, depression, internal and external tensions, urban growth, the "post industrial" society.
Instructor: Cornell
Offered by correspondence only: F,W,S, 1981-82.

Hist 237 Ancient Civilization: Greek
Not offered 1981-82.

Hist 238 Ancient Civilization: Roman
Not offered 1981-82.

Hist 251X F 0.5
History of Medieval Europe from 814-1033
The political, cultural, economic and ecclesiastical development of Europe from Charlemagne to Philip IV of France.
Instructor: MacKinnon

Hist 252X W 0.5
Europe in the Nineteenth Century
European social history 1750-1914. This course will consider interrelations among the family, social groups and institutions during the process of industrialization, urbanization and mass education.
Instructor: Harrigan

Hist 253X F 0.5
Canadian History: 1760-1900
The evolution of a distinctive Canadian society in the face of dominant British and American influences. Topics will include Loyalists and Rebellion, Confederation, western settlement and Riel.
Instructor: English

Hist 254X W,S 0.5
Canadian History: 1900-1979
"Canada's century" - 1900 to the present: emphasizing the development of a distinctive society through a consideration of such topics as: immigration, industrialization, feminism, labour unrest and the growth of western Canada.
Instructor: English

Hist 255X F 0.5
British Empire and Commonwealth
Instructor: Craton

Hist 256X W,S 0.5
History of the United States since 1865
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.
Instructors: Ostrander, Eagles

Hist 302 F 0.5
Medieval Church History from 312-1096
Instructor: Wahl
Offered at St. Jerome's College.

Hist 303 W 0.5
Medieval Church History 1096-1449
Instructor: Wahl
Offered at St. Jerome's College.

Hist 304 English History 1215-1485
Not offered 1981 82.
Hist 305 0.5

English History 1485-1603
A study of achievements and crises in politics and society, and of changes and continuities in religion and philosophy in the Tudor period.
Instructor: New
Offered by correspondence only: F, W, 1981-82.

Hist 307 British History, 1790-1867
Not offered 1981-82.

Hist 308 Britain since 1867
Not offered 1981-82.

Hist 311 0.5

Western European Cultural History, 1815-1890
Evolution of the idea of consciousness as seen in the major works and manifestoes of artists, writers, musicians, architects and thinkers of the period with particular emphasis on the roles assigned to "artists" (broadly defined) in the shaping of consciousness and society.
Offered by correspondence only: F, 1981-82.

Hist 319 French-Canadian History
Not offered 1981-82.

Hist 320 The History of Modern Quebec
Not offered 1981-82.

Hist 321 History of Canadian-American Relations to 1914
Not offered 1981-82.

Hist 322 W 0.5

History of Canadian-American Relations since 1914
An examination of the history of relations between the two countries since 1914. Topics of a political, economic, social and cultural nature will be studied.
Instructor: Ostrander

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 these native Canadians.
Instructor: Patterson

Hist 326 S 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.
Instructor: Patterson

Hist 329 W 0.5

History of Anglo-American Law
The emphasis will be on the early development of the common law in England and the formulation of constitutional law in the United States.
Instructors: Chernlavsky, Ostrander

Hist 331 0.5

East Africa prior to the Twentieth Century
Offered by correspondence only: F, 1981-82.

Hist 332 0.5

Eastern Africa in the Twentieth Century
Offered by correspondence only: W, 1981-82.

Hist 351 F 0.5

Canadian Black History
A study of the impact of modern racism and the assertion of black independence and identity. International dimensions illustrated from Africa and the United States, with special emphasis on the black experience in Canada.
Instructor: Walker

Hist 355 F 0.5

Russian History 1613-1825
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 nineteenth century.
Instructor: Davies

Hist 356 W 0.5

Russian History since 1825
The course will focus on selected themes in Russia's development in the nineteenth and twentieth centuries, including the Soviet period.
Instructor: Davies

Hist 386 W 0.5

Ontario History to 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.
Instructor: MacGillivray
Course Descriptions

History

Hist 387 S 0.5
Ontario History Since Confederation
The course will examine the emergence of Ontario as an industrial giant and the development of its hegemony in Canada. An emphasis will also be placed on the sources and methods of local historical research.
Instructors: Cornell, MacGillivray

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.
Prerequisite: 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.
Prerequisite: 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.

Hist 401X European 1.0
Hist 403X Canadian 1.0
Hist 405X British 1.0
Hist 407X Imperial 1.0
Hist 409X American 1.0

The following courses are administered by the Church Colleges.

Conrad Grebel College:

Hist 235G (RS 227G) F 2C,1D 0.5
History of Christianity 1
The development of Western and Eastern Christianity to the end of the medieval period.
Instructor: Klaassen

Hist 236G (RS 228G) W 2C,1D 0.5
History of Christianity 2
Roman Catholicism, Eastern Orthodoxy and Protestantism from the Reformation to the present.
Instructor: Klaassen

Hist 245G F 2C,1D 0.5
Canadian Minorities 1
A comparative study of minorities, whose development in Canada was conditioned by political conflict, especially in time of war. Included are Doukhobors, Germans, Japanese, Hutterites, Mennonites, Quakers, and Jehovah's Witnesses.
Instructor: Epp

Hist 246G W 2C,1D 0.5
Canadian Minorities 2
A comparative study of immigrant minorities, whose Canadian experience involved cultural conflicts: discrimination in education, distorted imagery in the mass media, linguistic coercion, etc. Groups include: Arabs, Chinese, Italians, Jews, Poles, Portuguese, Ukrainians.
Instructor: Epp

Hist 247G F 2C,1D 0.5
Mennonite History 1 (1525-1920)
Origins and developments in Switzerland, Germany, and the Netherlands. Migrations to, and settlements in, Prussia, Russia and North America. Topics include church-state relations, community formation, separation and assimilation, and conflicts in the Great War.
Instructor: Epp

Hist 248G W 2C,1D 0.5
Mennonite History 2 (1920-1975)
The world-wide Mennonite struggle for survival and meaningful identity in such settings as Communist Russia and Nazi Germany. Other topics: migrations to Latin America, assimilation in North America, new communities in Africa and Asia.
Instructor: Epp

Hist 343G Mystical and Utopian Movements from the 12th to the 17th Century 1
Not offered 1981-82.

Hist 344G Mystical and Utopian Movements from the 12th to the 17th Century 2
Not offered 1981-82.

Hist 347G F 0.5
Radical Reformation 1
A study of spokesmen for radical reform of the church including Andreas Carlstadt, Thomas Müntzer, Caspar Schwenfeldt, Sebastian Franck, Michael Servetus and others.
Alternates with Hist 343G
Instructor: Klaassen
Offered at Conrad Grebel College

Hist 348G W 0.5
Radical Reformation 2
A study of Anabaptism and its place in the history of the Christian church and of the Reformation period.
Alternates with Hist 344G.
Instructor: Klaassen
Offered at Conrad Grebel College
Hist 374G F 0.5  
**The Middle East Conflict**  
A survey of regional, religious and imperial rivalries from ancient to modern times, with emphasis on the 20th century and the Arab-Israeli conflict.  
*Instructor: Epp*

**Renison College:**

Hist 101R F 3C 0.5  
**Major Themes of Western Civilization 1**  
An introduction to the historical development of European civilization from Graeco-Roman and Judaeo-Christian origins to the emergence of sovereign states.  
*Instructor: Packull*

Hist 102R W 3C 0.5  
**Major Themes of Western Civilization 2**  
An introduction to the historical development of Western societies from the Reformation to the present. The course will survey the economic, social and intellectual trends during the period.  
*Instructor: Packull*

Hist 364R F 3C 0.5  
**The Enlightenment, 1: Europe in Ferment**  
An examination of the Seventeenth-Century background for the Enlightenment era, especially the economic, political, social and intellectual ferment of the period. The study will focus on continental Europe.  
*Prereq: a first year History course or consent of instructor.*  
*Instructor: Packull*

Hist 365R W 3C 0.5  
**The Enlightenment, 2: Europe in the 18th Century**  
The term will focus on the Enlightenment itself, its religious and political implications, and the practice of Enlightened Despotism in France, Prussia, Austria, and Russia.  
*Prereq: History 364H or consent of instructor.*  
*Instructor: Packull*

Hist 388R F 3C 0.5  
**History of Modern Revolutions 1**  
The beginnings of early modern revolutions that accompanied the break-up of feudalism, touching on the Peasants' Revolt of 1525, the English Revolution, the French Revolution, the revolutionary ideologies and the Russian Revolution of 1917.  
*Instructor: Packull*

Hist 389R W 3C 0.5  
**History of Modern Revolution 2**  
Germany in 1918, the emergence of right-wing revolutionary ideologies and movements in Europe, revolution in China.  
*Instructor: Packull*

**St. Jerome's College:**

Hist 125A F 0.5  
**The Ancient World**  
This course will survey various aspects of ancient western civilization: the foundations of political life, social organization, and intellectual development will be considered, including the development of the Greek city-state and the Roman Empire.  
*Instructor: Wahl*

Hist 125B W 0.5  
**The Medieval World**  
A survey of selected topics designed to illustrate the development of medieval Europe. The end of the Roman political system and the formation of new political groupings, in the West, the origins of feudalism, the crusades, and the Renaissance of the 12th century will be among the subjects considered.  
*Instructor: Wahl*

Hist 125C 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, the expansion of Europe, Old Regime society, the scientific revolution and the Enlightenment.  
*Instructor: Smith*

Hist 125D W 0.5  
**Modern Europe**  
A survey of selected topics to illustrate the chief features of modern European history. Topics will include the French Revolution, the Industrial Revolution, liberalism, nationalism, and socialism, industrial society and the New Imperialism, the World Wars and their aftermaths.  
*Instructor: Smith*
# Italian

**Italian Faculty**

*Assistant Professor*

V. F. Golini, *BA (McMaster), MA (Colorado)*

PhD (Berkeley)

*Lecturer*

A. Guatieri, *BA (Toronto), MA (Colorado)*

The following courses are administered by St. Jerome's College.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Term</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ita1 100J</td>
<td>Y</td>
<td>3C,1L</td>
<td>1.0</td>
</tr>
<tr>
<td><em>Introduction to Italian</em>&lt;br&gt;An intensive study of the fundamentals of grammar and conversation. The language laboratory will be used. In the first year of Italian, emphasis will be placed on the fundamentals of grammar and speech.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Term</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ita1 101J</td>
<td>F,W</td>
<td>3C,1L</td>
<td>0.5</td>
</tr>
<tr>
<td><em>Introduction to Italian</em>&lt;br&gt;Winter term of Ita1 100J.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Term</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ita1 102J</td>
<td>F,W</td>
<td>3C,1L</td>
<td>0.5</td>
</tr>
<tr>
<td><em>Introduction to Italian</em>&lt;br&gt;Fall term of Ita1 100J.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Term</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ita1 190J</td>
<td>Y</td>
<td>3C,1L</td>
<td>1.0</td>
</tr>
<tr>
<td><em>Intermediate Italian</em>&lt;br&gt;Advanced study of grammar, conversation and an intensive study of one or two novels. Some finer points of grammar will be studied but will actually be a secondary aspect. A survey of 19th century literature will be offered. &lt;br&gt;<em>Prereq: Ita1 100J or consent of instructor.</em></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Term</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ita1 191J</td>
<td>F</td>
<td>3C,1L</td>
<td>0.5</td>
</tr>
<tr>
<td><em>Intermediate Italian</em>&lt;br&gt;Fall term of Ita1 190J.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Term</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ita1 192J</td>
<td>W</td>
<td>3C,1L</td>
<td>0.5</td>
</tr>
<tr>
<td><em>Intermediate Italian</em>&lt;br&gt;Winter term of Ita1 190J.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Term</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ita1 251J</td>
<td>F</td>
<td>3C</td>
<td>0.5</td>
</tr>
<tr>
<td><em>Conversation and Composition</em>&lt;br&gt;This course offers extensive practice in idiomatic spoken and written language. Conversation will be based on social, political, and cultural aspects of Italian life. &lt;br&gt;<em>Prereq: Ita1 190J (191J/192J), or permission of instructor.</em></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Term</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ita1 252J</td>
<td>W</td>
<td>3C</td>
<td>0.5</td>
</tr>
<tr>
<td><em>Conversation and Composition</em>&lt;br&gt;Continuation of Italian 251J. &lt;br&gt;<em>Prereq: Ita1 251J.</em></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Term</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ita1 291J</td>
<td>F</td>
<td>3C</td>
<td>0.5</td>
</tr>
<tr>
<td><em>Italian Culture</em>&lt;br&gt;This course, given in English, aims at giving the student a well-balanced view of Italy and her culture, through the study of her Geography, History, Religion, Literature, Arts, Music and her contribution to the world and to North America in particular. &lt;br&gt;<em>Prereq: Second year standing.</em></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Term</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ita1 292J</td>
<td>W</td>
<td>3C</td>
<td>0.5</td>
</tr>
<tr>
<td><em>Italian Culture</em>&lt;br&gt;A continuation of Ita1 291J. &lt;br&gt;<em>Prereq: Second year standing.</em></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Term</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ita1 310J</td>
<td>Y</td>
<td>3C</td>
<td>1.0</td>
</tr>
<tr>
<td><em>From Dante to Machiavelli</em>&lt;br&gt;An intensive survey of major works from Dante to Machiavelli. Some attention will be given to examining the influence of Medieval and Renaissance Italian writers on European literature. &lt;br&gt;<em>Prereq: Ita1 190J, or 191J/192J, or consent of instructor.</em></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Term</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ita1 320J</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Italian Literature from 1600-1800</em>&lt;br&gt;Not offered 1981-82.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Term</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ita1 331J</td>
<td>F</td>
<td>3C</td>
<td>0.5</td>
</tr>
<tr>
<td><em>Masterpieces of Italian Literature in Translation</em>&lt;br&gt;Major authors will be studied to provide an understanding of the historical significance of Italian literature, especially the Medieval and Renaissance periods. Taught in English. &lt;br&gt;<em>No prereq.</em></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Term</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ita1 332J</td>
<td>W</td>
<td>3C</td>
<td>0.5</td>
</tr>
<tr>
<td><em>Masterpieces of Italian Literature in Translation</em>&lt;br&gt;Continuation of Ita1 331J. &lt;br&gt;<em>Taught in English.</em>&lt;br&gt;<em>No prereq.</em></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Term</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ita1 391J</td>
<td>F</td>
<td>2S</td>
<td>0.5</td>
</tr>
<tr>
<td><em>The Modern Italian Novel</em>&lt;br&gt;A brief study of the development of the Italian novel since Manzoni with concentration on the novels just before and after World War II. &lt;br&gt;<em>Prereq: Ita1 190J, 191J/192J, or consent of instructor.</em></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Course Descriptions

Italian

Kinesiology

Ital 392J 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 190J, 191J/192J, or consent of instructor.

Ital 396J F 2S 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.
No prereq.

Ital 397J W 2S 0.5

Special Topics/Directed Readings
Winter term of Ital 396J.
No prereq.

Department of Kinesiology

Associate Professor, Chairman of Department
M. T. Sharratt, BA, MA (W. Ont.), PhD (Wisconsin)

Professor, Dean of the Faculty of Human Kinetics
and Leisure Studies
G. S. Kenyon1, BPE (Br. Col.), MS (Indiana),
PhD (NYU)

Associate Professor, Associate Dean of Graduate
Affairs of the Faculty of Human Kinetics and
Leisure Studies
B. D. McPherson1, BA, MA, (W. Ont.), PhD (Wisconsin)

Associate Professor, Associate Chairman
Undergraduate Affairs
P. J. Bishop, BSc, BPE (Waterloo), MS (Western
Illinois), PhD (Minnesota)

Professor, Associate Chairman Graduate Affairs
R. G. Marteniuk2, BPE, MA (Alberta), EdD (Berkeley)

Associate Professor, Head of School of Anatomy
D. A. Ranney, BA (Toronto), MD (Toronto), FRCS
(England)

Professors
N. J. Ashton, BSc (McGill), MS (Michigan)
D. A. Winter3, BSc, MSc (Queen's), PhD (Dalhousie)

Associate Professors
H. J. Green, BA, BPHE (Queen's), MA (Alberta),
PhD (Wisconsin)
M. E. Houston, BSc (Toronto), PhD (Waterloo)
R. W. Norman, BS, BPE (McMaster), MSc (Alberta)
PhD (Penn State)
W. N. Widmeyer, BA (W. Ont.), BPE (McMaster) MA
(California), PhD (Illinois)
I. D. Williams, MS, PhD (Illinois)

Assistant Professors
F. Allard4, BA, BPE, PhD (Waterloo)
L. Brawley, BPE (Calgary), MSc (Oregon),
PhD (Penn State)
R. Hughson, BSc (W. Ont.), MSc (Br. Col.),
PhD (McMaster)
E. Roy, BSc (Waterloo), MPE (Br. Col.), PhD (Waterloo)
N. Theberge1, BA (Massachusetts), MA (Boston),
PhD (Massachusetts)
J. A. Thomson, BA, MSc (McMaster), PhD (Waterloo)
R. Wells, BSc (Manchester), MEng (McMaster),
PhD (Manchester)
Adjunct Associate Professors
E. English, MBA (UCLA), MD (Toronto), FRCS (Canada)
J. A. Israel, MD (Toronto), FRCS (Canada)
D. R. McTavish, MD (W. Ont.) FRCS
G. H. Mann, MB, BS (London), DRCOG (London)

Adjunct Assistant Professor
D. Rainham, MS, BB, BCh (Wales)

Faculty members holding cross appointments as shown
1Sociology
2Psychology
3Systems Design

Course Descriptions

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 116 W 3C 0.5
General and Organic Chemistry
An introduction to the chemical concepts of importance in kinesiology and health studies.

Kin 171 History of Sport and Physical Activity
Not offered 1981-82.

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. Prereq: Kinesiology, Health Studies and Dance students or permission of instructor. No Year 1 students admitted.

Kin 201 W 3C,2L 0.5
Human Anatomy of the Brain, Head and Neck
The anatomical structure and function of the brain, cranial nerves and sense organs of the head are emphasized. Included is an introduction to the histology of the nervous system. An opportunity for some dissection of the head and neck is provided. Prerequisite: Kin 200 or consent of Instructor

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. Prereq: Kin students only.

Kin 252 W,S 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. Prereq: Kin 103 and Soc 101. Cross-listed as Rec 203 and Soc 348

Kin 255 W 3C,2L 0.5
Introduction to Psychomotor Behaviour
An information processing approach is used to introduce the principles of learning and performing fine and gross motor skills. In addition, social psychological variables are studied as they relate to the facilitation or decrement in learning and performance. Prereq: Kin 103 and Psych 101

Kin 280 Administration
Not offered 1981-82.

Kin 300 F,S 3C,2L 0.5
Physiology of Physical Activity
A study of the effects of physical activity on the muscular, circulatory and respiratory systems and the mechanisms through which the body adapts to activity and environment. Prereq: Biol 230, 233.

Kin 317 F 3C 0.5
Human Biochemistry
An elementary course in human biochemistry including the metabolism and function of proteins, carbohydrates, lipids, and hormones. Emphasis is placed on the application of biochemical principles to human movement. Prereq: Kin 116 or equivalent.

Kin 321 W,S 3C,2L 0.5
Introduction to the Biomechanics of Human Movement
Anatomical, neural and mechanical considerations in the qualitative and quantitative analysis of human movement are examined. Concepts related to the biostatics and biodynamics of linked segment models of human motion are introduced. Prereq: Phys 103, Kin 200 and 222.
Course descriptions

Kinesiology

Kin 330  W,S  3C  0.5
Research Design
An introduction to the basic principles of scientific inquiry in Kinesiology. A systematic treatment of the logic and practice of methods and techniques employed in research related to physical activity with an examination of design, sampling, data gathering and analysis.
Prereq: Kinesiology students only.

Kin 335  W,S  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 construction in field and laboratory situations.
Prereq: Kin 222.

Kin 340  F  3C,2L  0.5
An 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.
Prereq: Kin 200, 3rd and 4th year students only.

Kin 341  W  3C,2L  0.5
Selected Topics in Sports Medicine
A course for those students wishing additional study in the area of sports medicine. Topics to be presented include trauma to the head and vertebral column, internal injuries, heat problems and the medical and non-medical use of drugs in sport.
Prereq: Kin 340.

Kin 346  W,S  3C  0.5
Nutrition (Helth 346)
An elementary course in nutrition with special emphasis on diet for sport and certain physiological conditions.
Prereq: Kin 317 or equivalent.

Kin 352  F  3C  0.5
Aging, the Aged and Leisure: A Sociological and Social Psychological Perspective (Soc 373)
Employing a sociological and psychological frame of reference, the process and problems of aging are analysed. Special emphasis is given to the problem of leisure time in the later years of life.
Prereq: Soc 101 and one other Soc course. Offered even years only.

Kin 354  W,S  2C,1T  0.5
Social Psychology and Physical Activity
An examination of the social influences and group processes which occur within sport teams. Topics include conformity, the influence of onlookers and co-actors, leadership, group structures, and cohesion.
Prereq: Psych 101.

Kin 356  F  2C,1T  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  2C,1T  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 physiologic 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 neuroendocrine mechanisms involved.
Prereq: Kin 300 and 317.

Kin 402  F  3C  0.5
Hydrospace, Altitude and Aerospace Physiology
An examination of man's cardiorespiratory responses at rest and during work to 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 programmes for normally healthy individuals.
Prereq: Kin 300 and 321.
Kin 407  W  3C  0.5
The Physiology of Coronary Heart Disease (Health 407)
An examination of the pathology, risk factors and rehabilitation programmes related to coronary heart disease. Major emphasis is placed on the cardiorespiratory implications of exercise in the rehabilitation process.
Prereq: Kin 300 or equiv.

Kin 410  W  3C  0.5
Growth, Development and Aging (Health 410)
The physiology of growth, development and aging is examined with special reference to the influence of physical activity, diet and other environmental factors on the normal processes.
Prereq: Kin 200 and Biol 290.

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 and Psych 261 or permission of instructor.

Kin 420  F  3C  0.5
Kinesiological Considerations in Equipment Evaluation
The principles of evaluation and design of equipment for human use are studied from a Kinesiological perspective.
Prereq: Kin 321. 3rd and 4th year students only or consent of instructor. Kin 425 is advisable and may be taken concurrently.

Kin 425  F  3C,2L  0.5
Biomechanics of Human Movement
The quantitative analysis of human movement from a biomechanical perspective, including some neural control processes. Static, kinematic and kinetic analyses of single and multi-segment models of a variety of human movement forms are conducted.
Prereq: Kin 321.

Kin 426  W  3C,2L  0.5
Biophysical Signal Processing and Control Systems
Basic electricity and electronics for the student with a biophysical background. Application of signal processing techniques to biophysical signals encountered by kinesiology students. Modelling of biophysical systems, control systems associated with human movement and performance.
Prereq: Kin 321, Kin 300, Kin 357 or permission 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, supervised by a faculty member (see Kin 432 for range of topics). The proposal shall consist of three chapters which include: (1) an introduction or statement of the problem, (2) a review of the literature, (3) methods and procedures.
Prereq: 4th year Honours Kinesiology.

Kin 432  F,W,S  0.5
Research Project
An independent research project on an approved topic, supervised by a faculty member. (The first three chapters are completed as Kin 431.) The project may include survey, experimental or theoretical research, programme evaluation, mathematical modelling, fitness appraisal, etc.
Prereq: Kin 431.
It is strongly recommended that students planning graduate studies take Kin 431 and Kin 432.

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: 4th year Honours Kinesiology.

Kin 442  W  2C,2L  0.5
Adapted Physical Activity
The study of individual problems and their implications for the Kinesiologist. Body mechanic problems, orthopaedic disabilities, neurological disabilities, heart disturbances and respiratory problems are discussed.
Prereq: Kin 300.

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
The course focuses on the effect of participating in physical activity programmes upon the socio-psychological adjustment of the individual. Emphasis is given to the uniqueness of the individual personality and how a person reacts to different situations.
Prereq: Kin 354.
Kin 456  F  3C  0.5

Cognitive Dysfunction and Motor Skill (Psych 307)
An examination of issues related to understanding the cerebral organization of motor skill. Discussion of how certain movement disorders are a reflection of disturbances at different stages in the sequence of information processing.
Prereq: One of Psych 206, 207, or Kin 356
Cross-listed as Psych 307, which is not offered in 1981/82

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 Kinesiology 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 480  F,W,S  0.5

Coaching Foundations
A study of basic principles and philosophies of coaching today. Emphasis is placed upon the application of kinesiological principles of performance as well as social, organizational and resource problems pertinent to each of several sport sections.
The specific sections offered are:
Kin 481T - Volleyball, Kin 482T - Basketball, Kin 483T - Gymnastics, Kin 484T - Racquets, Kin 485T - Football, Kin 486T - Ice Hockey, Kin 487T - Field Hockey, Kin 488T - Aquatics, Kin 489T - Track and Field. Students must complete a minimum of three (3) sport sections before credit is given.
Prerequisite: Students must complete 1 Physical Activity course in order to enrol in that particular 480 section.

Physical Activity Courses
All physical activity courses are elective and non-credit and available only to students enrolled in Kinesiology. Students should consult with a faculty advisor concerning the applicability of these courses for entry into careers such as teaching.

In an attempt to satisfy those students who are keenly interested in teaching, the Sport Proficiency Certification Programme is available. The contents of this programme are tied to the requirements of the Colleges of Education and help to produce a more marketable graduate in this field. A small fee may be charged to cover the costs of printed materials, additional instruction, etc. Further information regarding this programme can be found in the Kinesiology Undergraduate Student Handbook.

The following activity courses are offered if there are sufficient requests.
Kin 180  Elem. Basketball, W,S
Kin 183  Gymnastics - Floor Exercises, F,W
Kin 187  Beginner Swimming, F
Kin 188  Elem. Aquatics, F,W
Kin 281  Elem. Volleyball, F
Kin 282  Elem. Lacrosse, W
Kin 283  Gymnastics - Apparatus, W (Men)
Kin 284  Gymnastics - Apparatus, W (Women)
Kin 285  Elem. Football, F,S
Kin 286  Elem. Badminton, W
Kin 287  Elem. Soccer, F (even years)
Kin 288  Elem. Wrestling, W
Kin 289  Elem. Rugger, F (odd years)
Kin 381  Elem. Tennis, F,S
Kin 382  Elem. Squash, F
Kin 383  Elem. Golf, F,S
Kin 384  Elem. Raquetball, W
Kin 385  Elem. Field Hockey, F,S
Kin 386  Elem. Ice Hockey, W
Kin 387  Elem. Curling, W
Kin 388  Int. Aquatics, W
Kin 389  Elem. Track and Field, F,S
Kin 389A  Outdoor Skills Camp, F
Kin 481  Adv. Volleyball, W
Kin 482  Adv. Basketball, F
Kin 483  Adv. Gymnastics, W
Kin 484  Adv. Raquets, W
Kin 485  Adv. Football, W,S
Kin 486  Adv. Ice Hockey, W
Kin 487  Adv. Field Hockey, F,S
Kin 488  Adv. Aquatics, W
Kin 489  Adv. Track and Field, F,S
Kin 489A  Ski School, W
Legal Studies

Associate Professor, Chairman and Undergraduate Advisor
M. F. McDonald, BA (Toronto), MA, PhD (Pittsburgh)

Members of the Legal Studies Committee

Professors:
P. G. Cornell, ED, MA, PhD (Toronto), FRHistS
D. C. Mackenzie, BA, MA, PhD (Princeton)

Associate Professors
C. G. Brunk, BA (Wheaton), MA, PhD (Northwestern)
A. R. Olsen, B. Comm (Sir G. Wms), MBA (W. Ont.)

Assistant Professors
R. C. Prus, BA (Manitoba), MA, PhD (Iowa)
R. P. Woolstencroft, BA, PhD (Alberta)

Courses

Students must complete five year-course equivalents of designated Legal Studies courses, as indicated below.

Section 1
Students are required to complete successfully all of the following courses:

Hist 210 History of Law, 0.5
Phil 327A Philosophy of Law - Part 1, 0.5
Sci 292 Aspects of Canadian Law, 0.5
Soc 370G Sociology of Law, 0.5

Total credits in Section 1: 2.0

Section 2
Students are required to complete successfully 2 year course equivalents from the following courses:

Econ 294 Business Law, 0.5
Env S 201 Introduction to Environmental and Planning Law, 0.5
Hist 329 The History of Anglo-American Law, 0.5
Phil 327B Philosophy of Law - Part 2, 0.5
P Sci 291 The Canadian Legal Process, 0.5
P Sci 333 Administrative Law (in 1980/81 offered as P Sci 392), 0.5
P Sci 363 Canadian Constitutional Law (in 1980/81 offered as P Sci 391), 0.5
Soc 224 Law and Order: Regulating Deviance, 0.5
Soc 227 Crime and Society, 0.5

Total Credits in Section 2: 2.0

Section 3
Students are required to complete successfully 1 year-course equivalent from the following courses:

Econ 493 Taxation: Personal, 0.5
Econ 494 Taxation: Corporations, 0.5
Hist 211 British History to 1803, 0.5
Hist 212 British History Since 1803, 0.5
PACS 202 Peace and Conflict Studies 2, 0.5
Phil 215 Professional Ethics, 0.5
Phil 226 Ethics and the Life Sciences, 0.5
Phil 329 War, Peace, and Justice, 0.5
P Sci 225 History of Political Theory 1, 0.5
P Sci 260A Canadian Government and Politics, 0.5
P Sci 264 American Government and Politics, 0.5
Soc 222 Juvenile Delinquency, 0.5
Soc 223 Deviance: Perspectives and Processes, 0.5
Soc 329 Crime as Business, 0.5

Total Credits in Section 3: 1.0
Man-Environment Studies

Associate Professor, Chairman
R. F. Keith, BSA (Guelph), MA, PhD (Michigan State)

Associate Professor, Undergraduate Officer
E. J. Farkas, BSE (Princeton), ScD (MIT) PEng (on Sabbatical Leave, Winter Term, 1982)

Professors
G. R. Francis, BA (Toronto), BA (McGill), MA (Br. Col), PhD (Michigan)
C. K. Knappera, BA (Sheffield), PhD (Sask.) (on Sabbatical Leave 1981-82)
P. H. Nash$, BA, MA (UCLA), CE (Grenoble), MCP, MPA, PhD (Harvard), MCIP

Associate Professors
C. E. De'Ath, BA (Auckland), ASOPA Cert. (Sydney), MEd, PhD (Pittsburgh)
D. Estrins, BA, LLB (Alberta)
S. K. Gupta, BSc, MSc (Punjab), MA, PhD (Toronto)
G. B. Priddle$, BA (W. Ont.), MA, PhD (Clark) (on Sabbatical Leave 1981-82)

Adjunct Associate Professor
A. T. O'Brien, BS (Marymount), PhD (Fordham)

Assistant Professors
M. C. Th. Kesik-Delfgaauw, BEcon (Amsterdam), MA (Waterloo)
S. C. Lerner, BA (Ohio State), MA (Columbia)
G. O. Michalenko, BA, PhD (Sask.)
A. V. Morgan$, BA (Leicester), MA (Calgary), PhD (Waterloo)
J. E. Robinson, BSc (Waterloo), MES (York)

Faculty members holding cross and/or joint appointment(s) as shown

1Geography, Planning and School of Landscape Architecture, Univ. of Guelph
2Man-Environment Studies and Earth Sciences
3Environmental Studies and Psychology
4Environmental Studies
5Man-Environment Studies and Environmental Studies

Course Descriptions

Env S 111 Introduction to the Study of the Future
See Env S course descriptions, page 322.

M Env 130 F 3C 0.5
Environmental Issues 1
Survey and analysis of selected environmental issues drawing upon concepts and theories from the natural and social sciences and the humanities.
Prereq: Honours Man-Environment Studies.

M Env 131 W 3C 0.5
Environmental Issues 2
Continuation of M Env 130.
Prereq: Honours Man-Environment Studies.

M Env 150 F 3C 0.5
Environmental Methods and Techniques 1
Series of concurrent six week workshops to introduce methods and techniques appropriate for investigating different environmental problems. Students to select any two from a series of workshops such as field studies, laboratory analyses, questionnaire design, survey research, small group dynamics and participant observation of social interactions.

M Env 151 W 3C 0.5
Environmental Methods and Techniques 2
Continuation of M Env 150.

M Env 190 F 4S,1wkshp 0.5
Seminar-Workshop
Faculty supervised individual or small group investigation of selected environmental issues to help develop skills for defining and resolving problem situations.
Prereq: Honours Man-Environment Studies.

M Env 191 W 4S,1wkshp 0.5
Seminar-Workshop
Continuation of M Env 190.
Prereq: Honours Man-Environment Studies.

Env S 195A Introduction to Environmental Studies
See Env S course descriptions, page 322.

Env S 195B Introduction to Environmental Problems
See Env S course descriptions, page 322.

Env S 200 Field Ecology
See Env S course descriptions, page 322.

Env S 201 Introduction to Environmental and Planning Law
See Env S course descriptions, page 322.
Env S 202  Social Science Approaches to Environmental Problems  
See Env S course descriptions, page 322.

M Env 241  W  3C  0.5  
Social Change  
An analysis of major theories of social change, the sources and patterns of change processes with emphasis on the environmental context. Provides an opportunity to explore aspects of change which are of special interest to the student.

M Env 247  F  3C  0.5  
Urban Anthropology  
Approaches to the study of urban centres as undertaken by anthropologists. Selected topics such as urban social networks, the urbanization of non-western societies, and the culture of poverty will be pursued.
Prereq: Anth 102 or permission of instructor.

M Env 250  F,W  3C  0.25/0.5  
Environmental Methods & Techniques  
250A (0.25 course credit)  
250B (0.5 course credit)  
Series of concurrent six week workshops to continue the methods and techniques offerings of M Env 150/151. Students to select one or two from a series of workshops such as field studies, laboratory analyses, questionnaire design, survey research, small group dynamics and participant observation of social interactions.

Env S 252  Media Tools for Environmental Studies  
See Env S course descriptions, page 322.

Env S 253  Media Tools for Environmental Studies - Advanced Level  
See Env S course descriptions, page 322.

M Env 260  W  3C  0.5  
Visual Perception and Communication  
An exploration of the nature of perception and its relationship to communication with special reference to visual phenomena.
Prereq: Consent of instructor.

Env S 271  Introduction to Quantitative Research Methods  
See Env S course descriptions, page 322.

Env S 272  Computer Programming in Environmental Studies  
See Env S course descriptions, page 322.

M Env 275  F,W  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.

M Env 290  Y  8S-wkshp  1.0  
Seminar-Workshop  
The course begins with an examination of the design and conduct of research including elements of philosophy of science, goal-setting, research techniques, design and analysis. With this background students will prepare a project proposal to be conducted throughout the balance of the year in consultation with selected faculty advisors.
Prereq: Second year Honours Man-Environment Studies.

M Env 295  Y  2C,1S  1.0  
Development of Environmental Thought  
Through the use of Ascent of Man film series and a number of texts, this course will provide an historical perspective on the development of environmental thought, with special emphasis on the role of science and technology.
Prereq: Honours Man-Environment or consent of instructor.

Env S 310  Behavioural Studies  
See Env S course descriptions, page 322.

M Env 320  F,W  3C  0.5  
Environmental Economics  
Principal economic concepts and their environmental implications. Examination of the economic approach to environmental quality. Introduction to social benefit-cost analysis as applied to environmental problems.

M Env 331  W  2C  0.5  
Environmental Issues in a Global Perspective  

Env S 333  Parkland Management  
See Env S course descriptions, page 322.
M Env 335  W  2C  0.5
Amyntology of Education
A seminar on selected theories of socialization, acculturation and eniculturation. These theories will be related to what in the west is usually categorized as "education". There will also be some emphasis on understanding how field work should be done in educational settings. Students should be prepared to do some field work themselves.
Prereq: Anth 102A or consent of instructor.

M Env 336  F  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.
Prereq: Second year or above Environmental Studies students or consent of instructor.

M Env 340  F  3C  0.5
Chemical Basis of Pollution Control and Waste Management
Important principles of inorganic, physical, and organic chemistry, and material balance principles of chemical engineering are presented at a practical level. Application to pollution control, waste management, and/or transportation accidents accompanies discussion of each principle.
Prereq: Honours Man-Environment Studies and a high school chemistry course.

M Env 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 take part in one group project to experience the process at first hand.

M Env 351  W  3S  0.5
Organizations and Environmental Management
Analyses of inter-jurisdictional and inter-organizational arrangements governing major environmental-resource complexes in Canada. Policy and other issues relating to the development of coherent, effective planning and management systems for such complexes. The course will focus on one particular environmental-resource complex each year to serve as an on-going case study. Examples may include the Great Lakes system, agricultural lands in Canada, development north of 60°, off-shore resources to the 200-mile limit.

M Env 356  W  3C  0.5
Canadian Non-Renewable Resources
An introduction to mineral resources and the state of reserves of selected minerals. Geological factors affecting the occurrence of economic minerals and rocks, concentrating upon energy minerals. Political and social implications are discussed.
Cross-listed as Sci 350.

Env S 358  Environmental Pollution and its Control
See Env S course descriptions, page 322.

M Env 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.

M Env 361  F,S  3C  0.5
Communication Systems and International Development
Study of the role of mass media - films, TV, radio, press - in formulating concepts of development and change in different societies.
Prereq: M Env 260 or consent of instructor.

M Env 375  F,W  2R  0.5
Special Readings or Seminars on Selected Topics
Prereq: Consent of instructor.

M Env 375F/475F  Environments of Work
M Env 375I/475I  International Development and Environmental Issues
M Env 375K/475K  Issues in Resources Law
M Env 375P/475P  Environmental Education
M Env 375S  Social Impact Assessment
M Env 375Z  Politics of the Environment

Env S 380/381  Environmental Studies Workshop
See Env S course descriptions, page 322.

M Env 385  F  3C,1S  0.5
Technology/Lifestyles for a Conserver Society
Based upon a Conserver Society approach, the course will focus upon energy as a central and symbolic issue. Energy alternatives will be discussed with emphasis on the technologies of alternate energy systems and on the social, political and economic implications.
Prereq: Second year or above.
M Env 390  Y  4.8S,wkshp  1.0/2.0
Seminar-Workshop
390A (1 course credit)
390B (2 course credits)
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. Extra credit only by consent of faculty. Prereq: Honours Man-Environment Studies.

Env S 400  Professional Development in Environmental Management
See Env S course descriptions, page 322.

M Env 400  Y  3C  1.0
Senior Honours Seminar
Case study analysis of environmental problems and their handling by various organizations, institutions, and inter-organizational arrangements. Actor analysis, feasibility studies, program evaluation, and 'environmentally sound' development. Roles for 'environmentalists' in various organizational contexts.
Prereq: Third or fourth year Man-Environment Studies or consent of instructor.

Env S 401  Environmental Law
See Env S course descriptions, page 322.

Env S 402  Planning Law
See Env S course descriptions, page 322.

M Env 410  Y  3S  1.0
Environmental Management
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 programmes.
Prereq: Hon. Man-Environment Studies or instructor consent.

Env S 411  Alternative Future Environments 1
See Env S course descriptions, page 322.

Env S 412  Alternative Future Environments 2
See Env S course descriptions, page 322.

Env S 417  Land Use History and Landscape Change 1
See Env S course descriptions, page 322.

Env S 418  Land Use History and Landscape Change 2
See Env S course descriptions, page 322.

Env S 444  Land Evaluation and Resources Management
See Env S course descriptions, page 322.

M Env 445  Y  3C  1.0
Technology Assessment and Policy Analysis
The focus of this course is upon technology assessment processes and systems with particular attention to actors, information, decisions, strategies, issues and policy analysis. In the context of technological developments, policy statements and policy-making structures and processes will be examined.
Prereq: Honours Man-Environment Studies fourth year or consent of instructor.

M Env 450  Y  2S  1.0
Environmental Design
Major psycho-social problems related to design and use of urban, rural and/or wilderness environments. Integration of psycho-social information with economics and environmental information in the design process.
Prereq: Honours Man-Environment Studies or consent of instructor.

M Env 470  Y  3C  1.0
Environmental Teaching and Learning
Examination of physical and social environments which induce particular kinds of learning. Practical training and experience in project development and co-ordination, leadership and group facilitation processes.
Prereq: Third and fourth year Honours Man-Environment Studies or consent of instructor.

M Env 475  F,W  2R  0.5
Special Readings or Seminar on Selected Topics
See course descriptions under M-Env 275 and 375. Prereq: Consent of instructor.

M Env 476  Y  2R  1.0
Special Readings or Seminar on Selected Topics
Prereq: Consent of instructor.

M Env 480  Y  3S  1.0
Special Topics Seminar
Topics will be selected from areas of special interest and experience of individual faculty members, reflecting current research or other academically related activities. Topics will change from year to year, dependent on student demand, faculty availability, and priorities of issues before Canadian society.

M Env 490  Y  4.8,12C  1.0/2.0/3.0
Senior Honours Assignment
490A (1 course credit)
490B (2 course credits)
490C (3 course credits)
A project of sufficient scope to demonstrate mastery of problem solving and communication skills on a selected problem or issue concerning man-environment interrelationships. Variable credit only by consent of faculty.
Prereq: Honours Man-Environment Studies.
Course Descriptions

Management Sciences

Department of Management Sciences

Professor, Chairman of the Department
D. W. Conrath, BA (Stanford), MS (Carnegie Tech)
MA, PhD (UC, Berkeley) PEng

Professor, Associate Chairman
E. A. Silver, BEng (McGill), ScD (MIT), PEng

Professors
D. J. Clough, BASc, MBA (Toronto), PEng
P. M. Reilly1, BASc (Toronto), DIC PhD (London),
FSS, PEng
S. D. Saleh, BA (Cairo), MA, PhD (Case Western
Reserve)

Associate Professors
I. Bernhardt, BA (NYU) PhD (UC, Berkeley)
F. E. Burke, BA (London), PEng
M. J. Magazine, BS (CCNY), MS (NYU),
MEng, PhD (Florida), PEng
J. B. Moore, BASc (Toronto), MMath, PhD (Waterloo),
PEng
M. Scriabin, MBA, PhD (Simon Fraser)
R. G. Vickson, BSc (Br. Col.), PhD (MIT)

Assistant Professors
J. D. Fuller, BSc, (Queen's), MSc, PhD (Br. Col.)
F. Safayeni, BS (Idaho), MSc, PhD (Victoria)

Lecturer
V. Mason, BASc, MASc (Toronto), PEng

Faculty Member holding cross appointment as shown:
1Department of Chemical Engineering

Course Descriptions

M Sci 21  F,W  3C  0.5
Probability and Statistics 1
Axiomatic development of probability. Conditional
probability, Bayes' Theorem and independence.
Discrete and continuous random variables. Special
cases of uniform, binomial, Poisson, and normal
mathematical expectation. Derived distributions.
Sampling from normal populations. Estimating
parameters and testing hypotheses.

M Sci 23  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 31  W  2C,1T  0.5
Probability and Statistics 2
Linear statistical models. General regression theory
and applications. Design of orthogonal experiments
and industrial applications. Correlation coefficient
analysis. Elementary time series analysis.
Prereq: M Sci 21 or equivalent

M Sci 43  W  2C,1T  0.5
Managerial and Engineering Economics 2
Measurement of cost and productivity in enterprises.
Models of household and enterprise behaviour.
Seller strategy regarding product characteristics,
price and promotion in consumer and industrial
markets. Valuation of nonmarket goods. Evaluation
of private and public investments.
Prereq: M Sci 23 or equivalent

M Sci 44  F,S  3C  0.5
Organizational Behaviour 1
Introduction to the concepts of learning, person
perception, attitudes and motivation in an
organization. Consideration of communication, roles,
norms and decision making within a group.
Discussion of power, control, leadership and
management in light of the above concepts.

M Sci 46  F,W,S  3C  0.5
Operations Research 1
The Operations Research approach to problem
solving. Deterministic mathematical programming
including linear programming, transportation
method, assignment problem, network methods, and
dynamic programming. Elements of deterministic
inventory models.
Management Studies

Courses are offered in five fundamental areas of management: money, people, materials, data and communications. These courses are taught by experts in Management Sciences, English, Philosophy, Psychology, Economics, Computer Science and Mathematics.

As a university programme, Management Studies must be taken in conjunction with an existing Honours Major. Students should be prepared to take a number of courses that presuppose a thorough understanding of basic mathematics.

A Management Studies Major or Minor can reduce or eliminate the need for make-up courses in management often required for a business promotion. Furthermore, the skills and knowledge gained from the programme allow the graduate to manage his personal life and professional career with purpose and efficiency. As such, a university degree with a Management Studies option will be attractive to employers.

*Although M120A, M124B, CS180 and Stat 210 are recommended as a sufficient body of knowledge as corequisites and prerequisites, alternative sequences of courses in some Faculties may be substituted according to the following table. It should be noted that the alternative sequences are most applicable in the case of the Minor.

<table>
<thead>
<tr>
<th>Arts</th>
<th>E S</th>
<th>HKLS</th>
<th>Science</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 120A</td>
<td>M 104 or Econ 211</td>
<td>M 104</td>
<td>M 107</td>
</tr>
<tr>
<td>M 124B</td>
<td>M 103</td>
<td>M 103</td>
<td>M 103</td>
</tr>
<tr>
<td>CS 180</td>
<td>CS 180</td>
<td>ES 271</td>
<td>CS 180/</td>
</tr>
<tr>
<td>Stat 210</td>
<td>Econ 221</td>
<td>ES 271</td>
<td>Rec 270</td>
</tr>
</tbody>
</table>

The programmes for a Joint Honours or for a Minor in Management Studies are as follows:

Joint Honours ‘x’ with Management Studies
(Where ‘x’ is any departmental area which chooses to make a Joint Major designation in Management Studies available to its Honours students.)

In addition to the Honours requirements of ‘x’, a minimum average of 70% must be achieved on the following twenty half credits:

Econ 101;
Econ 191, 192 or Econ 281*, 282*;
Econ 193, 194 or Bus 111, 121;
M Sci 43 or Econ 241;
M Sci 31; M Sci 46;
M Sci 47 or 48;
M Sci 44, 53 or Psych 333, Soc 340; CS 330, 331; Phil 216;
Engl 210 or Sci 209 plus an oral report on a written paper.
One of Econ 294, ES 201, Pol Sci 291, 292;
Plus two two-course sequences to be approved by a Faculty Adviser.

The following are examples of some two and four course sequences which may be chosen:

Environmental Management
Plan 357, Env Stud 400

Industrial Psychology
Psych 333 if not already taken

Formal Organizations
Soc 340 if not already taken

Financial Reporting
Econ 291, 292, 491, 492

Management Information Control Systems
Econ 391, 392, 495, 497

Financial Management and Investments
Econ 393, 394, 391, 496

Econometrics
Econ 102, 321, 421, 422

Taxation
Econ 291, 292, 493, 494

*Econ 281, 282 are a terminal sequence of courses in Accounting and are recommended for non-accountants.

Honours 'y' with a Management Studies Minor
(Where 'y' is any departmental area which chooses to make a Minor designation in Management Studies available to its Honours students.)

In addition to the Honours requirements of 'y', a minimum average of 70% must be achieved on the following ten half credits:

Econ 101;
Econ 191, 192 or Econ 281*, 282*;
Econ 193 or Bus 111;
M Sci 44, 53 or Psych 333, Soc-340;
M Sci 46;
CS 330; Phil 216;
Engl 210 or Sci 209 plus an oral report on a written paper.

Students planning to enter either of the above programmes must consult with their Faculty Adviser and in addition should inform the Director of the Programme who is at present Professor C. F. A. Beaumont, Chairman, Department of Applied Mathematics.

*Econ 281, 282 are a terminal sequence of courses in Accounting and are recommended for non-accountants.

Faculty of Mathematics

Dean of the Faculty of Mathematics
J. A. George, MSc (Alberta), PhD (Stanford)

Associate Deans, Undergraduate Studies
K. D. Fryer, BA, (W. Ont.), PhD (Toronto)
I. J. McGee, BASc (Toronto), MSc (Waterloo),
PhD (Yale)

Associate Dean, Graduate Studies
R. B. Simpson, MASc (Toronto), PhD (Maryland)

Director of Undergraduate Affairs
P. C. Brillinger, BA (McMaster), MA (Waterloo)

Director, Mathematics Computing Facility
J. L. Morris, BSc (Leicester), PhD (St. Andrews)

Director of Computer Communications Network Group
E. G. Manning, MSc (Waterloo) PhD (Illinois)

Director, Statistical Consulting Service
G. W. Bennett, BSc, BA, PhD (Adelaide)

Director, Mathematics/Commerce Group
C. F. A. Beaumont, BA, (McMaster), MA (Toronto)

Associate Director, Mathematics/Commerce Group
R. G. Dunkley, BA (W. Ont.)

Associate Director, Operations Research Group
R. N. Burns, BSc (Toronto), PhD (Waterloo)

Lecturer
R. G. Scoins, MMath (Waterloo)

Adjunct Lecturer
R. G. R. Lawrence, QC

University Computing Officer
W. M. Gentleman, BSc (McGill), PhD (Princeton)
Department of Applied Mathematics

Associate Professor and Chairman of the Department
C. F. A. Beaumont, BA (McMaster), MA (Toronto)

Associate Professor and Associate Chairman of the Department
G. J. Lastman, MA (Br. Col.), PhD (Texas)

Professors
J. Cizek, RNDr (Charles University, Prague), CSc (Czechoslovak Academy of Sciences, Prague)
H. F. Davis, PhD (MIT)
S. G. Davison, PhD (Manchester)
B. Forte, PhD (Pisa), Habil DSc (Rome)
J. A. George, MSc (Alberta), PhD (Stanford)
G. M. L. Gladwell, BSc, PhD, DSc (London)
F. O. Goodman, BSc (London), PhD (London), DSc (London), FInstP, FA/P
W. H. Hui, BSc (Peking), PhD (Southampton)
F. R. McCourt, BSc, MSc, PhD (Br. Col.)
I. J. McGee, BASc (Toronto), MSc (Waterloo), PhD (Yale)
M. A. McKiernan, MA (Loyola), PhD (IIT)
J. Paldbus, RNDr (Charles University, Prague), CSc (Czechoslovak Academy of Sciences, Prague)
M. M. Pintar, BSc, MSc, PhD (Ljubljana)
P. J. Ponzo, MA (Toronto), PhD (Illinois)
D. G. Wertheim, BA (McMaster), PhD (Toronto)

Associate Professors
C. B. Collins, BSc (London), PhD (Cambridge)
J. Froese, BA (Manitoba), MA (Queen's), PhD (Br. Col.)
G. W. Horndeski, BSc (Washington University), PhD (Waterloo)
R. G. McLennan, MSc (Queen's), PhD (Cantab)
L. Morris, BSc (Leicester), PhD (St. Andrews)
C. Rogers, BA (Hons) (Oxford), MEd (Toronto), MSc, PhD (Nottingham), FIMA FInstP
J. Wainwright, BSc (Natal), PhD (South Africa)
R. A. Wentzell, BSc (Acadia), PhD (W. Ont.)

Assistant Professors
S. P. Lipshitz, BSc Hons (Natal), MSc (South Africa), PhD (Witwatersrand)
M. E. Snyder, BSc (W. Ont.), MSc (Waterloo)

Lecturer
B. J. Marshman, PhD (Waterloo)

Adjunct Professors
Y. C. Cheng, PhD (Br. Col.)
M. A. Donelan, PhD (Br. Col.)
D. J. Henderson, BS (Br. Col.), PhD (Utah), FInstP
M. S. Klamkin, BChE (Cooper Union), MS (Brooklyn)
D. Lovelock, PhD, DSc (Natal)
H. Rund, PhD (Cape Town), Habilitation (Freiburg)
R. F. Woolsey, PhD (Texas)

Faculty Members holding cross-appointments as shown:
1 Applied Mathematics and Chemistry
2 Applied Mathematics/Statistics/Computer Science/Pure Mathematics
3 Computer Science and Applied Mathematics
4 Civil Engineering and Applied Mathematics
5 Chemistry and Applied Mathematics
6 Pure Mathematics and Applied Mathematics
7 Physics and Applied Mathematics

Department of Combinatorics and Optimization

Professor and Chairman of the Department
J. A. Bondy, DPhil (Oxon)

Associate Professor and Associate Chairman of the Department
C. E. Haif, BS (Stanford), PhD (Waterloo)

Associate Professor and Associate Chairman of the Department
P. J. Schellenberg, PhD (Waterloo)

Distinguished Professor
W. T. Tutte, PhD (Cantab), FRSC

Professors
G. Berman, MA, PhD (Toronto)
J. Edmonds, BA (Geo Washington), MS (Maryland)
K. D. Fryer, BA (W. Ont.), PhD (Toronto)
P. L. Hammer, PhD Math (Bucharest)
R. C. Mullin, BA (W. Ont.), PhD (Waterloo)
R. C. Read, MA (Cantab), PhD (London)
E. H. Swart, BScEng (Witwatersrand), MSc (UNISA), DSc (Pretoria)
D. H. Younger, PhD (Columbia)

Associate Professors
M. Best, MMath (Waterloo), PhD (UC Berkeley)
R. N. Burns, BSc (Toronto), PhD (Waterloo)
A. R. Conn, BSc (Imperial College), MSc (Manitoba), PhD (Waterloo)
L. J. Cummings, PhD (Br. Col.)
R. A. Honsberger, BA (Toronto), MA (Waterloo)
D. M. Jackson, PhD (Cantab)
U. S. R. Murty, MA (Osmania), PhD (Indian Stat. Inst.)
L. B. Richmond, MSc (Manitoba), PhD (Alberta)
S. A. Vanstone, PhD (Waterloo)

Assistant Professors
L. J. Dickey, MA (Arizona), PhD (Wisconsin)
I. P. Goulden, BMath, PhD (Waterloo)

Lecturers
E. Anderson, BA (McMaster)
R. G. Dunkley, BA (W. Ont.)
Adjunct Professors
P. Erdős, PhD (Budapest), DSc (Manchester)
L. Lovász, Dr.Rher. Nat. (Eötvos L., Budapest), Dr.Math.Sci. (Hung. Acad. Sci.)
C. St. J. A. Nash-Williams, PhD (Cantab), FRSE
K. Ritter, Dhab (Karlsruhe)

Faculty Member holding joint appointment as shown:
1. Computer Science and Combinatorics and Optimization

Faculty Members holding cross-appointments as shown:
2. Pure Mathematics and Combinatorics and Optimization
3. St. Jerome's and Combinatorics and Optimization
4. Statistics and Combinatorics and Optimization

Department of Computer Science

Professor and Chairman of the Department
J. A. Brzozowski, MASc (Toronto), PhD (Princeton)

Associate Professor and Associate Chairman for Undergraduate Studies
J. I. Munro, BA (New Br.), MSc (Br. Col.), PhD (Toronto)

Associate Professor and Associate Chairman for Graduate Studies
K. O. Geddes, BA (Sask.), MSc, PhD (Toronto)

Professors
E. A. Ashcroft, BA (Cantab), PhD (Imperial College)
D. D. Cowan, BASc (Toronto), PhD (Waterloo)
K. Culik, MSc, RNDr (Prague), PhD (Czechoslovak Acad Sci)
B. Forte1, PhD (Pisa), Habil DSc (Rome)
W. M. Gentleman2, BSc (McGill), PhD (Princeton)
J. A. George3, MSc (Alberta), PhD (Stanford)
J. W. Graham, MA (Toronto)
Recipient of Distinguished Teacher Award
J. D. Lawson, BASc (Toronto), PhD (Waterloo), FIMA
E. G. Manning, MSc (Waterloo), PhD (Illinois)
R. B. Simpson, MASc (Toronto), PhD (Maryland)

Associate Professors
R. H. Bartels, MS (Michigan), PhD (Stanford)
A. R. Conn4, BSc (London), PhD (Waterloo)
J. F. Gentleman5, MS (Chicago), PhD (Waterloo)
J. Majithia6, BSc (London), MEng,PhD (McMaster)
M. A. Malcolm, BSc, MEng (Denver)
MS, PhD (Stanford)
F. Mavaddat, BSc (Tehran), PhD (London), DIC
J. Li. Morris7, BSc (Leicester), PhD (St. Andrews)
M. H. van Emden, MEngMath (Delft), PhD (Amsterdam)
J. W.-N Wong, PhD (UC Los Angeles)

Assistant Professors
J. C. Beaty, AB (Math) (Princeton), PhD (UC Berkeley)
K. S. Booth, BS (Calif Inst Tech), PhD (UC Berkeley)
T. A. Cargill, BSc (Reading), PhD (Waterloo)
V. A. Dyck, MMath (Waterloo)
G. H. Gonnol, Cpr.U. (Uruguay), PhD (Waterloo)
B. L. Leong, AB (UC Berkeley), PhD (Penn State)
T. S. E. Malbaun, BSc (Toronto), PhD (London)
D. H. Redelmeier, B. Math (Waterloo), PhD (Toronto)
D. Rotem, BSc (Hebrew Univ Jerusalem), PhD (Witwatersrand)
D. J. Taylor, BSc (Sask), MMath, PhD (Waterloo)
F. W. Toma, ScM (Brown), PhD (Toronto)
J. H. Vellinga, BA (W. Ont.), MA (Waterloo) (part-time)
J. W. Welch, BSc (McGill), PhD (Waterloo) (part-time)

Lecturers
R. L. Newkirk, BSc, MSc (W. Ont.) (part-time)

Research Associates
T. C. Brown, MS (North California), PhD (Calif. Inst. Tech.)
T. R. S. Walsh, PhD (Toronto)

Adjunct Professors
P. H. Dirksen MA (Waterloo)
S. C. Johnson, BA (Haverford College, Pa.), PhD (Columbia)
T. Pietrzykowski, MA (Warsaw), PhD (Polish Acad. Sci.)

Adjunct Associate Professors
D. C.-L. Lam, BSc (Hong Kong), PhD (Waterloo)
D. E. Morgan, BSc (Rose Polytechnic Inst.), MS (Michigan), PhD (Waterloo)

Adjunct Assistant Professor
J. A. Smith, PhD (Waterloo), PEng

Faculty Members holding cross-appointments as shown:
1. Applied Mathematics/Statistics/Computer Science/Pure Mathematics
2. Computer Science and Statistics
3. Computer Science and Applied Mathematics
4. Statistics and Computer Science
5. Electrical Engineering and Computer Science
6. Computer Science and Combinatorics and Optimization
Department of Pure Mathematics

Professor and Chairman of the Department
G. E. Cross, MA (Dalhousie), PhD (Br. Col.)

Associate Professor and Associate Chairman for Undergraduate Affairs
W. J. Gilbert, MA (Cantab), DPhil (Oxon)

Associate Professor and Associate Chairman for Graduate Affairs
J. W. Lawrence, MSc (McGill), PhD (Carleton)

Distinguished Professor
J. Aczel, PhD (Budapest), HabilDSc (Hungarian Acad Sci), FRSC

Professors
S. Burris, PhD (Oklahoma)
D. Z. Djokovic, PhD (Belgrad)
B. Forte*, PhD (Pisa), Habil DSc (Rome)
H. Haruki, PhD (Osaka)
P. Hoffman, BA (Toronto), PhD (Manchester)
Pl. Kannappan, BScHons (Annamalai), PhD (Washington)
M. A. McKiernan*, MA (Loyola), PhD (ITT)
R. A. Staats, PhD (Toronto)
J. W. Tucker*, BSc (London), PhD (London)

Associate Professors
J. A. Baker, MA (Sask), PhD (Waterloo)
L. J. Cummings*, PhD (Br. Col.)
D. A. Higgs, BScHons (Witwatersrand), MA (Cantab), PhD (McMaster)
A. Kerr-Lawson*, BA (Toronto), MA (Chicago), PhD (McMaster)
E. Moskal, BA (Toronto), PhD (Illinois)
D. Mowat*, PhD (Waterloo)
C. T. Ng, BSc (Chinese Univ), PhD (Waterloo)
F. C. Y. Tang, BSc (Hong Kong), MS (South Carolina), PhD (Illinois)
F. Zorzitto, BSc (Windsor), PhD (Queen's)

Assistant Professors
A. A. Adamson, MMath (Waterloo), PhD (Berkeley)
K. R. Davidson, BMath (Waterloo), PhD (Berkeley)
L. J. Dickey*, MA (Arizona), PhD (Wisconsin)
K. A. Rowe, BSc (Toronto), MS (Wisconsin), PhD (Illinois)
C. L. Stewart, BSc (Br. Col.), MSc (McGill), PhD (Cantab)

Faculty Members holding cross-appointments as shown:
1Applied Mathematics/Statistics/Computer Science/Pure Mathematics
2Pure Mathematics and Applied Mathematics
3Pure Mathematics and Philosophy
4Pure Mathematics and Combinatorics and Optimization
5St. Jerome's and Pure Mathematics

Department of Statistics

Associate Professor and Chairman of the Department
J. F. Lawless, BSc, MSc, PhD (Waterloo)

Associate Professor and Associate Chairman of the Department
M. E. Thompson, BSc (Toronto), MSc, PhD (Illinois)

Associate Professor and Associate Chairman, Actuarial Science
W. H. Aitken, BA (Toronto), FSA, FCIA, EA

Professors
H. M. Atrubin, BA (Manitoba), FSA, FCIA (part-time)
G. A. Barnard, MA (Cambridge), DSc (London), FIMA, HonARCS
W. F. Forbes, BSc, PhD, DSc (London), DIC, ARCS
B. Forte*, PhD (Pisa), HabilDSc (Rome)
W. M. Gentleman*, BSc (McGill), PhD (Princeton)
V. P. Godambe, BSc (Bombay), PhD (London)
J. D. Kalbfleisch, BSc, MMath, PhD (Waterloo)
J. G. Kalbfleisch, BSc (Toronto), MA, PhD (Waterloo)
P. M. Reilly*, UE, BSc (Toronto), DIC, PhD (London), Peng
R. J. Shah, BA, MA (Bombay), PhD (Indian Stat. Inst.)
D. A. Sprott*, BA, MA, PhD (Toronto), FRCS, FRPS
M. D. Vogel-Sprott*, BA (McMaster), MA, PhD (Toronto)

Associate Professors
G. W. Bennett, BSc, BA, PhD (Adelaide)
M. A. Bennett, BA (Nottingham), FSA, FCIA
K. S. Brown, BMath, PhD (Waterloo)
W. H. Cherry, BSc, PhD (Melbourne)
J. F. Gentleman*, BA, MS (Chicago), PhD (Waterloo)
R. J. MacKay, BSc (Waterloo), MSc, PhD (Toronto)
H. H. Panjer, BA, MA, PhD (Western), FSA, FCIA
F. G. Reynolds, BSc, MSc (Manitoba), FSA, FCIA
W. S. Rickert, BSc, PhD (Waterloo)
J. C. Robinson, BASc, MASC, PhD (Waterloo)
J. B. Whitney, BA, MA (W. Ont.), PhD (Toronto)
J. C. Young, BASc (Toronto), MSc (Waterloo), PhD (Edinburgh)

Assistant Professors
B. Abraham, BSc (Kerala), MSc (Guelph), PhD (Wisconsin)
A. Brender, BSc (McGill), MA, PhD (UC Berkeley), ASA, FSA, FCIA
R. L. Brown, BMath (Waterloo), FSA, FCIA, ACAS
M. J. Goddard, BSc (Toronto), MSc, PhD (LSHTM)
I. P. Goulden*, BMath, MMath, PhD (Waterloo)
D. E. Matthews, BA, MA (W. Ont.), PhD (London), DIC
C. Minder, Dip1 Math (Basel), MMath, PhD (Waterloo)
Lecturer
C. Springer, BSc, MSc (McGill)

Adjunct Professors
I. P. Fellegi, BSc (Budapest), MSc, PhD (Carleton)
A. Finch, BSc, ARCS, PhD, DSc (London), DIC
J. Gani, BSc, DIS (London), PhD (ANU), DSc (London), FAA

Faculty Members holding cross-appointments as shown:
1. Applied Mathematics/Statistics/Computer Science
   Pure Mathematics
2. Computer Science and Statistics
3. Chemical Engineering and Statistics
4. Statistics and Psychology
5. Psychology and Statistics
6. Statistics and Computer Science
7. Statistics and Combinatorics and Optimization

Strategy Board Members

University of Waterloo Faculty of Mathematics

R. S. Aberg
Vice President
Oil Sands Administration
Shell Canada Limited

M. W. Bainbridge
Director
Post-Secondary Recruitment Programme
Public Service Canada

Dr. D. C. Baxter
Assistant Auditor General
Control Evaluation Branch

E. G. Burton
President
Simpsons Limited

G. Corlett
Deputy Comptroller
Noranda Mines Limited

B. Graham
Partner
Coopers and Lybrand

W. D. Jones
Senior Manager
Systems and Data Processing
The Steel Company of Canada, Limited

Dr. G. E. Lee-Whiting
Theoretical Physics Branch
Chalk River Nuclear Laboratory
Atomic Energy of Canada Ltd.

R. G. Logan
Director External Programs
IBM Canada Limited

D. C. MacTavish
Chief Actuary
Mutual Life Assurance Co. of Canada

E. L. Pursey
Vice President and Controller
Accounts and Control Division
Canadian Imperial Bank of Commerce

Dr. C. D. Sadleir
Assistant Vice President
Systems Planning
Bell Canada

G. F. Sekely
Director
Information Systems
Canadian Pacific Limited

R. P. Wismer
Vice President Development
Canadian Imperial Bank of Commerce

Dr. D. T. Wright
Deputy Minister
Culture and Recreation
Province of Ontario

The University of Waterloo Strategy Board was established to provide liaison between the Faculty of Mathematics and knowledgeable representatives from key sectors of the economy. Board meetings are normally held twice a year.

Faculty of Mathematics

Course Offerings – Notes

1. Courses with the following abbreviations are offered by the Faculty of Mathematics: 'ACTSC' (Actuarial Science), 'AM' (Applied Mathematics), 'C&O' (Combinatorics & Optimization), 'CS' (Computer Science), 'Math' (non-departmental faculty courses), 'MTHEL' (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, and providing space is available, these courses are open to students in any UW faculty provided that stated prerequisites have been met.

2. Courses offered by the Faculty of Mathematics which have been designed with the academic needs and backgrounds of students in other faculties in mind are identified by a note following the course description. These courses appear in the sequence described above. They are: AM 101, 111, 405; CS 112, 115, 116, 118, 316; Math 103, 104, 105, 106, 107, 110a/b, 111a/b, 113, 114, 115a/b, 210, 211, 212, 213a/b, 215, 216, 226; Stat 202, 204, 205, 210, 300, 500.
Actuarial Science

Course Descriptions

Note
Course descriptions are given under the new course numbers introduced in 1981. The old numbers appear in brackets.

ACTSC 221 F,W,S 3C 0.5 (STAT 270)
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.
N.B.: Only one of ACTSC 221, 231 can be taken for credit. Students planning to enrol in Honours Actuarial Science must take ACTSC 231.

ACTSC 231 F,W 3C 0.5 (STAT 273)
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 130a/b
N.B.: Only one of ACTSC 221, 231 can be taken for credit. Students planning to enrol in Honours Actuarial Science must take ACTSC 231.

ACTSC 232 F,W,S 3C 0.5 (STAT 284)
Introduction to Life Contingencies
Applications of probability to problems of life and death. The determination of single and annual premiums for assurances and annuities. Reserves. Company expenses and their incorporation into premium and cash value calculations.
Prereq: ACTSC 221 or 231 and MTHEL 305a

ACTSC 331 F,W,S 3C 0.5 (STAT 374)
Life Contingencies – Single Life Functions
An advanced course on problems with single lives, including population theory.
Prereq: ACTSC 232

ACTSC 332 F,W 3C 0.5 (STAT 384)
Life Contingencies – Multiple Life Functions
An advanced course on problems with multiple lives; multiple decrement theory; accidental death and disability benefits.
Prereq: ACTSC 331.

ACTSC 337 F,W,S 3C 0.5 (STAT 373)
Finite Differences
A course in the calculus of finite differences, to include: summation, numerical integration and differentiation, relation between integration and summation; error theory; topics in numerical analysis.
Prereq: Math 130a/b

ACTSC 338 Graduation of Life Tables (STAT 486)
Not offered 1981-82

ACTSC 391 F,W 3L 0.5 (STAT 383)
Topics in Actuarial Mathematics
Topics in Actuarial Mathematics for students intending to take the professional examinations.
Prereq: ACTSC 231, 337

ACTSC 431 F,S 3C 0.5 (STAT 477)
Risk Theory 1
Prereq: Stat 330, Math 332B or consent of instructor.

ACTSC 432 W 3C 0.5 (STAT 487)
Risk Theory 2
Calculations of net premiums and reinsurance premiums. Ruin theory. Utility theory.
Prereq: ACTSC 431

ACTSC 433 F,S 3C 0.5 (STAT 475)
Construction of Life Tables
Methods of analysis of data to produce raw rates for mortality, morbidity and other tables.
Prereq: ACTSC 232, or consent of instructor.

ACTSC 435 F,S 3C 0.5 (STAT 476)
Introduction to Demographic Statistics
Topics in demography with emphasis on population projections, mortality theories, and construction of life tables.
Prereq: ACTSC 232, or consent of instructor.

ACTSC 441 F,S 3L 0.5 (STAT 474)
Advanced Topics in Actuarial Mathematics
Topics in Actuarial Mathematics for students intending to take the professional examinations.
Prereq: ACTSC 232, 331, 332, or consent of instructor.

ACTSC 451 Selection of Risks 1 (STAT 471)
Not offered 1981-82

ACTSC 452 Selection of Risks 2 (STAT 481)
Not offered 1981-82
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Term</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
</table>
| 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 retirements, plan design and actuarial assumptions on Pension costs. Cost forecasts applied to private and public pension plans – in particular to the CPP.  
Prereq: ACTSC 435, 453, or consent of instructor. |
| ACTSC 455   | F    | 3C 0.5  | Analysis of Financial Statements  
Topics in insurance financial reporting and in the analysis of gains and losses.  
Prereq: ACTSC 332 |
| ACTSC 456   | W    | 3C 0.5  | Taxation of Life Insurance  
Taxation of life insurance, insurance companies and employee benefits.  
Prereq: ACTSC 332, MTHEL 305a and 305b |
| ACTSC 458   | W    | 3C 0.5  | Insurance Law  
Topics in Canadian and American Insurance Law.  
Prereq: ACTSC 331, MTHEL 305a and 305b |
| 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 232 |
| ACTSC 464   | W    | 3C 0.5  | Topics in Casualty Insurance 2  
A continuation of ACTSC 463.  
Prereq: ACTSC 463 |
| ACTSC 491   | W    | 3C 0.5  | Seminar in Actuarial Mathematics 1  
Selected topics for the advanced actuarial student. N.B.: May or may not be offered 1981-82.  
Prereq: Consent of instructor. |
| ACTSC 492   | W    | 3C 0.5  | Seminar in Actuarial Science 2  
Selected topics for the advanced actuarial student.  
Prereq: Consent of instructor. |
| AM 101      | F    | 3C,1T 0.5 | Applications of Mathematics 1  (For Biology Students)  
Prereq: None  
N.B.: Not open to students in the Faculty of Mathematics |
| AM 111      | W    | 3C,1T 0.5 | Applications of Mathematics 2  (For Biology Students)  
Prereq: AM 101, or consent of instructor.  
N.B.: Not open to students in the Faculty of Mathematics |
| AM 230, 240, 260, 270, 340, 430, 440 | | | AM 230, 240, 260, 270, 340, 430, 440 is a sequence of courses designed to illustrate the representation of a real situation by a mathematical model. The mathematical techniques necessary to formulate the model and to discuss its behaviour are developed as required. Examples will be taken from diverse fields since one of the aims of each course is to formulate models to describe unfamiliar situations. |
| AM 230      | F    | 2C,1T 0.5 | Applications of Mathematics  
Ordinary differential equations will be applied to models drawn from biology, economics, physiology and physics.  
Prereq: Math 120a/b  
N.B.: Credit will be given for only one of AM 230, 260. |
| AM 240      | W    | 2C,1T 0.5 | Application of Mathematics  
Other examples from biology, ecology, economics, physiology and physics will be discussed using sets of differential equations.  
Prereq: AM 230 or Math 220b  
N.B.: Credit will be given for only one of AM 240, 270. |
AM 260  F,W  2C  0.5
Mathematical Modelling
Mathematical models for problems in the physical and biological sciences. Typical problems chosen from ecology, special relativity, spread of epidemics, rumours and tumors. Solutions to problems will be obtained primarily by differential equations.
Prereq: Math 130a/b.
N.B. Credit will be given for only one of AM 230, 260.

AM 270  F,W  2C  0.5
Mathematical Modelling
Further mathematical models from various disciplines. An introduction to Newtonian mechanics will also be included in the course.
Prereq: AM 260 or consent of instructor.
N.B.: Credit will be given for only one of AM 240, 270.

AM 340  W  2C  0.5
Applications of Mathematics
Difference equations, Laplace transforms applied to discrete and continuous mathematical models taken from ecology, biology, economics and other fields.
Prereq: Math 220a/b or consent of instructor.

AM 362  F  2C,1T  0.5
Elementary Differential Geometry and Tensor Analysis
Curves in Euclidean 3-space (E^3) and the Serret-Frenet formulae; surfaces in E^3 and their intrinsic geometry. Gaussian curvature and the Gauss-Bonnet theorem. 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 230a/b, or consent of instructor.
N.B.: Cross listed with PMath 365.

AM 364  W  2C,1T  0.5
Special Relativity
A tensorial formulation of special relativity, Lorentz transformations and flat space-time; relativistic mechanics and collision phenomena; Maxwell’s equations in tensorial form and some of their solutions; energy-momentum tensor of the electromagnetic field and of a fluid; spinors and representations of the Lorentz group. Reference will be made throughout to the experimental verification of special relativity.
Prereq: AM 362/P Math 365, Phys 364, or consent of instructor.

AM 365  W  2C,1T  0.5
Introduction to Continuum Mechanics
Prereq: Math 230a/b, or consent of instructor.

AM 371  F,S  2C,1T  0.5
Partial Differential Equations of Applied Mathematics 1
First order partial differential equations and methods of characteristics, second order partial differential equations, boundary value problems and related numerical methods, vibrating string, 2-D membranes, heat equation and related problems; introduction to vector analysis.
Prereq: AM 260, Math 230a/b, or consent of instructor.

AM 381  F,S  2C,1T  0.5
Ordinary Differential Equations 1
Existence and uniqueness theorems, second and higher order equations, series solutions and Special Functions, Laplace transforms. Application to Mathematical Physics.
Prereq: Math 230a/b.

AM 391  W  2C,1T  0.5
Ordinary Differential Equations 2
Prereq: AM 381.

AM 395  F  2C,1T  0.5
Mechanics
Prereq: Math 230a/b, or consent of instructor.

AM 389  F  0.5
Reading Course

AM 399  W  0.5
Reading Course
AM 405 Y 2C 1.0
**Applied Analysis** (For Science Students)
Prereq: Consent of instructor.
N.B.: Not open to students in the Faculty of Mathematics.

AM 430 F 2C 0.5
**Applications of Mathematics**
Integral equations and integral transforms will be applied to systems with memory.
Prereq: Consent of instructor.

AM 440 W 2C 0.5
**Applications of Mathematics**
As a project, students will develop a mathematical model and interpret its behaviour.
Prereq: Consent of instructor.

AM 461 F 2C 0.5
**Non-Linear Differential Equations**
Non-linear mechanics, stability, quasi-linear and strongly non-linear systems, linear periodic systems, non-linear integral equations.
Prereq: AM 381/391, or consent of instructor.

AM 462 F 2C 0.5
**Measure and Integration**
The theory of measure and the Lebesgue integral.
Prereq: Math 332a or PMath 351a.

AM 463 F 2C,1T 0.5
**Introduction to Differentiable Manifolds**
Differentiable manifolds, vector fields, linear connections, tensor fields, differential forms, and the Cartan structure equations.
Prereq: AM 362 or consent of instructor.
N.B.: Cross listed with PMath 463.

AM 464 F 2C,1T 0.5
**Introduction to General Relativity**
Curved space-time and the Einstein field equations; the Schwarzschild solution; experimental tests of general relativity; the weak field limit; introduction to black holes; construction of stellar models; introduction to cosmology; 3 + 1 decomposition of space-time and the Cauchy initial value problem; methods of solving the field equations.
Prereq: AM 364, or AM 362 and consent of instructor.

AM 465 Y 2C 1.0
**Quantum Mechanics**
Prereq: Math 231ab, AM 371 or consent of instructor.

AM 466 F 3C 0.5
**Fluid Mechanics A**
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 2C 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 2C 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 2C,1T 0.5
**Selected Topics in Differential Geometry**
Depending on instructor, topics from pseudo-Riemannian and Riemannian geometry such as: isometries and Killing vector fields; sectional curvatures; submanifolds; normal co-ordinates; variation of geodesics and Jacobi fields; conformally related spaces.
Prereq: P Math 463/AM 463 or consent of instructor.
N.B.: Cross listed with P Math 465.

AM 476 W 3C 0.5
**Fluid Mechanics B**
Shock wave theory, supersonic flow around a corner, Prandtl-Meyer flow. Dynamics of real fluids, Navier-Stokes equations, exact solutions, Stokes and Oseen flow; Turbulence, Boundary layer theory. Introduction to Geophysical Fluid Dynamics.
Prereq: AM 466.

AM 478 W 2C 0.5
**Topics in Applied Mathematics**
Same as in AM 468.
Prereq: Consent of instructor.
AM 481  Y  2C  1.0
Partial Differential Equations of Applied
Mathematics 2
Second-order partial differential equations and
characteristics; d'Alembert's solution of the wave
equation, concepts of distributions, construction of
Green's functions, Fourier integral theorem, integral
transforms, integral equations, variational properties
of eigenvalues and eigenfunctions, special functions,
asymptotic series. All these methods are applied to
physical problems.
Prereq: AM 371, 381, 391, or consent of instructor.

AM 482  W  2C,1T  0.5
Calculus of Variations
Euler-Lagrange equations for constrained and
unconstrained single and double integral variational
problems. Parameter-Invariant single integrals.
General variational formula. The canonical
formalism. Hilbert's independent integral. Hamilton-
Jacobi equation and the Caratheodory complete
tigure. Fields and the Legendre and Weierstrass
sufficient conditions.
Prereq: Math 230a/b, or consent of instructor.

AM 485  F  2C  0.5
Electromagnetism
Applications of Maxwell's equations. Introduction to
wave guides and antennae.
Prereq: Phys 253 or consent of instructor.

AM 486  F  2C  0.5
Statistical Mechanics
Applications of probability theory to theoretical
Physics.
Prereq: Consent of instructor.

AM 488  F  3C  0.5
Control Theory
Dynamical systems, controllability and observability.
Minimization of functions and functionals. Optimal
Prereq: Consent of instructor.

AM 489  F  0.5
Reading Course

AM 495  W  2C,1T  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 365.

AM 499  W  0.5
Reading Course
Course Descriptions
Combinatorics and Optimization

C & O 331 W 3C 0.5 (C & O 386b)
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 (or Math 321a)
Offered by St. Jerome's College.

C & O 342 F,W,S 3C 0.5 (C & O 370a)
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: Math 224a (or Math 221a/b)

C & O 343 F,W 3C 0.5 (C & O 370b)
Graph Theory 2
Prereq: C & O 342

C & O 350 F,W,S 3C 0.5 (C & O 331a)
Linear Programming
Prereq: Math 224a (or Math 221a/b)

C & O 351 F,W 3C 0.5 (C & O 331b)
Network Flow Theory
Prereq: C & O 350

C & O 367 F,S 3C 0.5 (C & O 433a)
Mathematical Programming
Prereq: Math 220b and Math 224a (or Math 221a/b)

C & O 370 F,S 3C 0.5 (C & O 340)
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: Math 224a (or Math 221a/b)

C & O 371 W 3C 0.5 (C & O 341)
Stochastic OR Models
An introduction to the use of probabilistic models in operations research. Techniques and applications of queueing theory, inventory theory and reliability theory.
Prereq: Stat 221

C & O 380 F,S 2C 0.5 (C & O 384)
Mathematical Discovery and Invention 1
A study of about 100 challenging problems taken from many areas of elementary mathematics - number theory, combinatorics, geometry, probability, logic.
Prereq: None

C & O 381 W 2C 0.5 (C & O 385)
Mathematical Discovery and Invention 2
A study of about 100 challenging problems taken from many areas of elementary mathematics - number theory, combinatorics, geometry, probability, logic.
Prereq: None

C & O 382 F 2C 0.5 (C & O 386a)
Combinatorial Geometry
Combinatorial aspects of the plane. The number of regions determined by various geometrical curves. Pick's theorem, Sylvester's triad problem, squaring the rectangle, convex sets and finite geometry.
Prereq: None
Offered at St. Jerome's College.

C & O 430 F 3C 0.5 (C & O 460)
Algebraic Enumeration
The course is an extension of C & O 330. The combinatorics of Eulerian generating functions, the algebra of sequence types, maximal decomposition theorem, Lagrangian methods and their applications. Random walks and the Hopf factorization. Symmetric functions and plane partitions.
Prereq: C & O 330

C & O 434 F 2C 0.5 (C & O 462)
Combinatorial Design
This is a continuation of C & O 330. Topics covered include error correcting codes, resolvable designs, affine designs, weighing matrices, and their interaction.
Prereq: C & O 330 and Math 324a (or Math 331b)
C & O 438 W 3C 0.5 (C & O 464a)

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 330 and C & O 342 are recommended.

C & O 439 W 2C 0.5 (C & O 470b)
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 (C & O 470a)
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,S 2C 0.5 (C & O 431a)
Combinatorial Optimization
Prereq: C & O 351

C & O 452 W 2C 0.5 (C & O 436)
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 (C & O 447a)
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 C & O 370

C & O 456 W,S 3C 0.5 (C & O 442a)
Game Theory
An introduction to the analysis, through appropriate mathematical models, of competitive situations such as those arising in social, economic, political or military conflict. Emphasis is placed on the theory of two-person games.
Prereq: C & O 350

C & O 458 W 3C 0.5 (C & O 433b)
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 C & O 350, CS 370, or consent of instructor.

C & O 459 W,S 2C 0.5 (C & O 449)
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 (C & O 443b)
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 367

C & O 466 F 2C 0.5 (C & O 432)
Continuous Optimization
Prereq: C & O 367
History of Mathematics 1
A study of selected topics from Greek geometry. Some related work of post-renaissance scholars is included. Topics include: famous construction problems, pythagorean arithmetic, regular solids, four discoveries of Archimedes, the problem of Apollonius; selected works of Archimedes, Euclid, Apollonius, Euler, Steiner.
Prereq: None

History of Mathematics 2
A study of selected topics from post-renaissance mathematics. Topics include material on prime numbers, Fermat's Last Theorem, the Gaussian Integers, the Fibonacci Sequence, other topics from elementary number theory, a collection of outstanding problems in geometry (Fagnano, Steiner-Lemus, Morley).
Prereq: None

Reading in Combinatorics and Optimization
Prereq: Consent of department

Computer Science

Course Descriptions

Note
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 112, CS 115, CS 116, CS 718, CS 316

Introduction to Business Problem Solving by Computer
Emphasis on the solution of mathematical problems in business. Concept and properties of an algorithm. Language and notation for describing algorithms. Analysis of problems, development of models and algorithms, implementation in a procedure-oriented language (usually FORTRAN IV); execution of these programs using several systems.
Prereq: none
N.B.: Credit will only be granted for one of CS 112, CS 116, CS 118 or CS 140. CS 112 cannot be counted for credit toward a BMath degree.

Introduction to Scientific Problem Solving by Computer
An introduction to the analysis of scientific problems, development of mathematical models and algorithms for their solution; implementation in a procedure-oriented language (normally FORTRAN IV). Topics discussed are: solution of equations, computation of integrals, graph plotting, and simulation.
Prereq: Grade 13 mathematics is recommended.
N.B.: Credit will only be granted for one of CS 112, CS 116, CS 118 or CS 140. CS 112 cannot be counted for credit toward a BMath General or Honours degree.

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 IV). Topics discussed are: solution of equations, computation of integrals, graph plotting, and simulation.
Prereq: Grade 13 mathematics is recommended.
N.B.: Credit will only be granted for one of CS 112, CS 116, CS 118 or CS 140.
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: Grade 13 mathematics is recommended.
N.B.: Credit will only be granted for one of CS 115 or CS 180.

CS 210  F  3C  0.5
Introduction to Numerical Computing
A survey of numerical procedures with emphasis upon computer implementation using the FORTRAN IV programming language. Topics include: interpolation, curve fitting, solution of non-linear equations, numerical integration, numerical solution of ordinary and partial differential equations, matrix algebra, and solution of systems of linear equations.
Prereq: at least one course in calculus, algebra, and computer science.
N.B.: CS 210 cannot be counted for credit toward a BMath Honours degree.
Credit will only be granted for either CS 210 or for the courses in the CS370/371 sequence.

CS 240  F,W,S  2C,2T  0.5
Programming Principles, Languages, and Techniques
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: CS 140 or CS 180 or the equivalent. CS 250 is recommended.

CS 250  F,W,S  2C,2T  0.5
Characteristics of Computers and Computer Systems
Introduction to machine and assembly language programming and basic machine architecture. Addressing modes, indexing, and indirection. Subroutine linkage and macro instructions. Characteristics of peripheral devices. A survey of software which assists user programs: assemblers, compilers, loaders, input/output routines, operating systems.
Prereq: CS 116 or CS 118 or CS 140 or CS 180

CS 316  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.
N.B.: CS 316 cannot be counted for credit toward a BMath degree.

CS 330  F,W,S  2C  0.5
Computer Applications in Business: Introduction
A discussion of the implementation of business procedures on computers. Students study and modify a computerized accounting system as an illustration of the methods used. The accounting system is then extended to consider other applications such as inventory control and also more complicated file structures to improve the performance of the system.
Prereq: CS 180; (Econ 191/192 or 281/282) or consent of instructor.
N.B.: CS 330 cannot be counted for credit toward a B Math Honours Computer Science degree.

CS 338  F,W,S  3C  0.5
Computer Applications in Business: Data Bases and Data Communications
A user-oriented approach to data communications and to the management of large collections of data. The three basic models (hierarchical, network, and relational) are presented. Specific examples are used to illustrate data base design. Data communication principles are related to specific business applications.
Prereq: CS 330 or CS 340 or consent of instructor.
N.B.: Credit will only be granted for one of CS 338 or CS 448. CS 338 cannot be counted for credit toward a BMath Honours Computer Science degree.
Note: Formerly CS 331.

CS 340  F,W,S  3C  0.5
Data Structures
The study of data structures in a language independent setting. Levels of data description and their role in design of structures. The effects of secondary store. Introduction to the analysis of algorithms. Topics include: primitive data types; sequences; designing representation-independent data structures; tuples; arrays and tables; trees and forests; sets.
Prereq: CS 240
Course Descriptions
Computer Science

CS 350  F,W,S  3C  0.5
Machine Structures
The intent is to give a basic understanding of what goes on inside a computer, of machine architecture, and of some fundamental operating system services. Topics include: introduction to an actual computer; representation of data; memory; central processor; addressing schemes; input/output; linking and loading.
Prereq: CS 250 or E E 222
CS 369 or E E 323 is a recommended corequisite.

CS 360  F,W,S  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

CS 369  F,W,S  3C  0.5
Digital Networks
Prereq: CS 250 or E E 222

CS 370  F,W,S  2C,2T  0.5
Introduction to Scientific Computation: Numerical Algebra
Pitfalls in computation; solution of linear algebraic equations; finding zeros of a single nonlinear equation and systems of nonlinear equations; the algebraic eigenvalue problem. The emphasis is on exposure to modern computer techniques for solving mathematical problems. Heavy use of mathematical subroutine libraries is anticipated.
Prereq: Knowledge of a high level programming language, preferably FORTRAN; Math 220a/b, and Math 224a (or Math 221a/b)
N.B.: Credit will only be granted for either CS 210 or for courses in the CS 370/371 sequence.

Note
Enrolment in some fourth year courses may be restricted to students registered in Honours Computer Science.

CS 371  F,W  2C,2T  0.5
Introduction to Scientific Computation: Numerical Approximation
Polynomial interpolation; least squares and minimax approximation; numerical integration and differentiation; numerical solution of initial value problems and boundary value problems. As in CS 370, the intent is to expose students to modern computer techniques for solving mathematical problems.
Prereq: Knowledge of a high level programming language, preferably FORTRAN; Math 220a/b, and Math 224a (or Math 221a/b)
N.B.: Credit will only be granted for either CS 210 or for courses in the CS 370/371 sequence.

CS 370  F,W,S  3C  0.5
Business Systems Analysis
Prereq: CS 340, or CS 330 and 338 and fourth year standing.
N.B.: Credit will only be granted for one of CS 432 or CS 434 or CS 482. CS 432 cannot be counted for credit toward a BMath Honours Computer Science degree.

CS 432  W  3C  0.5
Computer Auditing
The responsibility of the auditor in relation to computer systems. Systems of controls and cost/effectiveness analysis of controls. Computer audit techniques. Case studies including examples of poorly controlled systems and computer abuse.
Prereq: BUS 477W and either CS 338 or CS 448
N.B.: Credit will only be granted for one of CS 432 or CS 434 or CS 482. CS 434 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: Stat 220; CS 330 and CS 338, or CS 340.
N.B.: Credit will only be granted for one of CS 437 or CS 457. CS 437 cannot be counted for credit toward a BMath Honours Computer Science degree.
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

Compiler Construction
Prereq: CS 340, 350, 360.

Applications Software Engineering
Practical computing problems encountered in scientific applications: an overview of batch operating systems; the importance of loaders and overlays; check points, post mortems, and operating system services; FORTRAN as a programming language; current programming techniques: design and use of program libraries and human engineering of input and output; magnetic tapes and bulk storage.
Prereq: CS 340

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
N.B.: Credit will only be granted for one of CS 338 or CS 448

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 blocks" - central processing units, stores, input/output systems, and bus structures. Case studies of machines.
Prereq: CS 350 and (CS 369 or El E 323)
CS 462  F  3C  0.5  
Formal Languages and Parsing  
Prereq: CS 360  
N.B.: This course may also be offered in the Spring.

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 fitting all models. Formal reducibilities between computational problems, and the complexity of these reducibilities. 
Prereq: CS 360

CS 466  F,S  3C  0.5  
Algorithm Design and Analysis  
Design of good algorithms and analysis of the resources they consume. Lower bounds on the resource requirements of algorithms to compute certain functions. Problems from the following areas are discussed in this light: sorting and order statistics, data structures, arithmetic computations, the NP-complete problems. 
Prereq: CS 340. 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

CS 472  W  3C  0.5  
Numerical Linear Algebra  
Prereq: CS 370, Math 324a (or 221b)

CS 473  W  3C  0.5  
Numerical Linear Programming  
Methods for the minimization and maximization of piecewise linear functions and linear functions subject to linear constraints, with applications to linear programming and data fitting. Emphasis is on algorithms, numerical considerations and software implementation. 
Prereq: One of CS 370, C & O 350, or consent of instructor.  
N.B.: Cross listed with C & O 458

CS 474  F  3C  0.5  
Numerical Approximation  
Prereq: CS 371, Math 322b

CS 476  F  3C  0.5  
Numerical Solution of Differential and Integral Equations  
Prereq: Consent of the instructor

CS 478  W  3C  0.5  
Numerical Solution of Partial Differential Equations  
Prereq: Consent of the instructor

CS 482  F,S  3C,2T  0.5  
Techniques in Systems Analysis  
Techniques in organization and management theory. Organization of large software systems. Data base concepts. Implementation of computer based information systems. Survey of current topics of interest such as distributed processing, microcomputers and on-line systems. 
Prereq: CS 340 and fourth year standing in Honours Computer Science.  
N.B.: Credit will only be granted for one of CS 432 or CS 434 or CS 482.
Introduction to Artificial Intelligence
Prereq: CS 340

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, Math 234b/334b (or 331a/b)

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 and CS 350; Math 234a (or 231a)

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 330 and CS 338, or CS 340, or equivalent.

Advanced Topics in Computer Science
See the course offerings list for topics available.

Advanced Topics in Computer Science
See the course offerings list for topics available.

Notes
1. Certain core Mathematics courses are offered at three different levels. The advanced level courses are intended for exceptionally gifted students in the Honours programme. A student pursuing an Honours degree may substitute the corresponding Advanced 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 Standing & Promotions Committee to switch from an Honours programme to General or Pass. In this case, the student must enrol in General level courses. The following table sets out corresponding advanced/honours/general courses.

<table>
<thead>
<tr>
<th>Advanced</th>
<th>Honours</th>
<th>General</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math 140a/b</td>
<td>Math 130a/b</td>
<td>Math 120a/b</td>
</tr>
<tr>
<td>Math 144a/b</td>
<td>Math 134a/b</td>
<td>Math 124a/b</td>
</tr>
<tr>
<td>Math 240a/b</td>
<td>Math 230a/b</td>
<td>Math 220a/b</td>
</tr>
<tr>
<td>Math 241a/b</td>
<td>Math 231a/b</td>
<td>Math 221a/b</td>
</tr>
<tr>
<td>Math 244a/b</td>
<td>Math 234a/b</td>
<td>Math 224a/b</td>
</tr>
<tr>
<td>Math 341a/b</td>
<td>Math 331a/b</td>
<td>Math 321a/b</td>
</tr>
<tr>
<td>Math 344</td>
<td>Math 334</td>
<td>Math 324</td>
</tr>
<tr>
<td>Math 351a</td>
<td>Math 332a</td>
<td>Math 322a</td>
</tr>
<tr>
<td>Math 352a</td>
<td>Math 332b</td>
<td>Math 322b</td>
</tr>
<tr>
<td>Stat 230/331</td>
<td>Stat 220/221</td>
<td></td>
</tr>
</tbody>
</table>

Prerequisites involving these core courses will be given in terms of the lowest level acceptable (e.g. 'Prereq: Math 130b' implies that Math 140b is also acceptable but Math 120b is not).

2. The Faculty of Mathematics is in the midst of implementing curriculum changes in its Linear and Abstract Algebra core courses. Accordingly, Maths 224a/b, 234a/b, 244a/b, have been phased into the Math Faculty's course offerings over the last year. Maths 221a/b, 231a/b, 211a/b have been phased out. Maths 324a/b, 334a/b will be phased in over the next year. Maths 321a/b, 331a/b will be phased out over the same period. Students with at least one half-credit from the sequence of courses to be phased out must continue to choose courses from that sequence. (Students in this category should plan...
their courses carefully to ensure that all course requirements in the 'old' sequence have been met before the phasing process is complete.) Otherwise, courses must be chosen from the new sequence. Under no circumstances, without written Faculty approval, should students mix courses from the old and new sequences.

Maths 321a, 331a will probably be offered for the last time in spring/81. Maths 321b, 331b will probably be offered for the last time in winter/82.

Maths 324ab, 334alb will be offered for the first time in 1981/82.

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.
N.B.: Not open to students in the Faculty of Mathematics. Math 103 does not cover all the material normally included in Grade 13 Algebra; however, superior performance (approximately 80%) would probably provide an adequate background for most courses that demand Grade 13 Algebra as a prerequisite (e.g. Math 124a). Grade 12 Mathematics is recommended.

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.
N.B.: Not open to students in the Faculty of Mathematics. Math 104 does not cover all the material normally included in Grade 13 Calculus; however, superior performance (approximately 80%) would probably provide an adequate background for most courses that demand Grade 13 Calculus as a prerequisite (e.g. Math 120a). Grade 12 Mathematics is recommended.

Math 105 F 3C 0.5
Mathematics (For Environmental Studies Students)
Quantitative analysis in environmental research. Elementary concepts in Algebra: notation, terminology, operations. Probability Theory. Permutations and Combinations, approaches to probability, dependent and independent events, conditional probability, distribution functions, including the Binomial, Poisson and Normal distributions, with applications to problems in Environmental Studies.
Prereq: None
N.B.: Not open to students in the Faculty of Mathematics.

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.
N.B.: Not open to students in the Faculty of Mathematics. This course is open to Kinesiology students who have not taken Grade 13 Calculus.

Math 107 F 3C,1T 0.5
Mathematics (For Kinesiology Students)
Content similar to that of Math 106 except that it will be assumed that students have completed Grade 13 Calculus. Accordingly, there will be broader consideration of applications.
N.B.: Not open to students in the Faculty of Mathematics.

Math 110a F 3C,2T 0.625
Calculus 1a (For Engineering Students)
Functions and their inverses, limits, continuity and derivatives. The trigonometric functions, their inverses and derivatives. Applications to rate, max./min., curve sketching problems. Sequences, the definite integral, the fundamental theorem of calculus. Applications to area and volume problems.
Prereq: Grade 13 Calculus
N.B.: Not open to students in the Faculty of Mathematics.
Math 110b  W,S  3C,2T  0.5
Calculus 1b (For Engineering Students)
The logarithmic and exponential functions and their
derivatives and applications. Elementary differential
equations. Integration techniques. Improper
integrals. Indeterminate forms. Arc length, average
values, work, centroids and centres of mass, fluid
force. Parametric and polar equations. Series of
constants and tests for convergence/divergence.
Power series. Taylor series. Operations on power
series.  
Prereq: Math 110a  
N.B.: Not open to students in the Faculty of
Mathematics.

Math 111a  F  3C,1T  0.5
Algebra and Solid Geometry (For Science Students)
Elementary Number Theory, number systems,
mathematical induction, the Binomial Theorem,
monotone sequences and the Cauchy criteria,
polynomials.  
Prereq: Grade 13 Algebra is recommended but not
required.  
N.B.: Not open to students in the Faculty of
Mathematics.

Math 111b  W,S  3C,1T  0.5
Algebra and Solid Geometry (For Science Students)
Determinants, vectors, matrices, elementary solid
gometry, systems of linear equations.  
Prereq: Grade 13 Algebra is recommended but not
required.  
N.B.: Not open to students in the Faculty of
Mathematics.

Math 113  Y  3C,2T  1.0
Calculus (For Arts and Science Students)
The derivative, differentiation of algebraic and
transcendental functions. Applications of the
derivative. The integral, applications of integration,
techniques of integration. Power series. Polar co-
ordinates. Some elementary differential equations.  
Prereq: Grade 13 Calculus  
N.B.: Not open to students in the Faculty of
Mathematics.

Math 114  F  3C,2T  0.625
Algebra and Vector Geometry (For Engineering
Students)
Matrix algebra. Systems of linear equations.
Determinants. Vectors in Euclidean space, lines,
planes, spheres. Eigenvalues. Introduction to vector
spaces.  
Prereq: Grade 13 Algebra  
N.B.: Not open to students in the Faculty of
Mathematics.

Math 115a  F  3C,2T  0.5
Calculus (For Co-op Physics & 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. Inverse
functions.  
Prereq: Grade 13 Calculus  
N.B.: Not open to students in the Faculty of
Mathematics.

Math 115b  W,S  3C,2T  0.5
Calculus (For Co-op Physics & Chemistry)
Techniques of Integration. Improper Integrals.
Indeterminate forms and L'Hôpital's rule. Infinite
Prereq: Math 115a  
N.B.: Not open to students in the Faculty of
Mathematics.

Math 119  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,
extrm value theorem, applications of the
derivative, the differential, the definite integral,
fundamental theorem of calculus.  
Prereq: Grade 13 Calculus  
N.B.: Math 119 is not open to Honours
Mathematics students.

Math 120a  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 120a  
N.B.: Math 120a is not open to Honours
Mathematics students.

Math 124a  F,W  3C,1T  0.5
Deductive Geometry
Euclidean geometry with emphasis on deductive
reasoning and problem solving, number systems.  
Prereq: Grade 13 Algebra  
N.B.: Math 124a is not open to Honours
Mathematics students.

Math 124b  F,W,S  3C,1T  0.5
Linear Algebra 1
Systems of equations, vector spaces, matrices,
determinants, geometric applications.  
Prereq: Grade 13 Algebra (Math 124a is
recommended, but not required)  
N.B.: Math 124b is not open to Honours
Mathematics students.
Math 130a  F  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 differential, the definite integral, fundamental theorem of calculus.
Prereq: Grade 13 Calculus
N.B.: Credit will only be granted for one of Math 120a, 130a, 140a. This course may also be offered in the spring term.
Also offered at St. Jerome’s College.

Math 130b  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 or 80% in Math 120a
N.B.: Credit will be granted for only one of Math 120b, 130b, 140b.
Also offered at St. Jerome’s College.

Math 134a  F  3C,1T  0.5
Algebra
Basic set theory, cardinality, elementary number theory, number systems, polynomials.
Prereq: Grade 13 Algebra
N.B.: Credit will be granted for only one of Math 124a, 134a, 144a. This course may also be offered in the spring term.
Also offered at St. Jerome’s College.

Math 134b  W,S  3C,1T  0.5
Linear Algebra 1
Systems of equations, vector spaces, matrices, determinants, geometric applications.
Prereq: Grade 13 Algebra (Math 134a or 80% in Math 124a, is recommended, but not required)
N.B.: Credit will be granted for only one of Math 124b, 134b, 144b.
Also offered at St. Jerome’s College.

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)
N.B.: Credit will be granted for only one of Math 120a, 130a, 140a. This course may also be offered in the spring term.

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)
N.B.: Credit will be granted for only one of Math 120b, 130b, 140b.

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)
N.B.: Credit will be granted for only one of Math 124a, 134a, 144a. This course may also be offered in the spring term.

Math 144b  W,S  3C  0.5
Linear Algebra 1
Math 144b is an advanced-level, enriched version of Math 134b.
Prereq: Math 134a
N.B.: Credit will be granted for only one of Math 124b, 134b, 144b.

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 110a/b
N.B.: Not open to students in the Faculty of Mathematics.

Math 211  F,W  2C,2T  0.5
Calculus 2 (For Electrical Engineers)
Differential calculus of functions of several variables. Differential equations. Multiple integrals.
Prereq: Math 110a/b
N.B.: Not open to students in the Faculty of Mathematics.

Math 212  F,S  2C,2T  0.5
Advanced Calculus (For Electrical Engineers)
Prereq: Math 211
N.B.: Not open to students in the Faculty of Mathematics.
Course Descriptions
Mathematics

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 113 or Math 115a/b or equivalent.
N.B.: Not open to students in the Faculty of
Mathematics.

Math 213b  F,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 Math 220a or equivalent.
N.B.: Not open to students in the Faculty of
Mathematics.

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 113 or Math 115a/b or equivalent
N.B. Not open to students in the Faculty of
Mathematics.

Math 216  F,S  3C  0.5
Differential Equations (For Physics or Chemical
Engineering Students)
Standard methods of solution. Applications to
physical engineering problems. Linear equations
with constant coefficients. Systems of differential
equations. Solution of differential equations by the
Laplace Transformation.
Prereq: Math 113 or Math 115a/b or equivalent
N.B.: Not open to students in the Faculty of
Mathematics.

Math 220a  F,W,S  3C,1T  0.5
Advanced Calculus
Differential calculus for functions of several
variables.
Prereq: Math 120b or equivalent
N.B.: Math 220a is not open to Honours
Mathematics students.

Math 220b  F,W,S  3C,1T  0.5
Advanced Calculus
Double integrals, triple integrals. Line integrals and
Green's theorem. Ordinary differential equations.
Prereq: Math 220a
N.B.: Math 220b is not open to Honours
Mathematics students.

Math 221a
Linear Algebra
A selection of topics from: vector spaces, linear
maps, matrix theory, inner products, bilinear and
quadratic forms, and applications.
Prereq: Math 124a/b
See note 2 preceding 'Math' course descriptions.

Math 221b
Linear Algebra
A continuation of Math 221a.
Prereq: Math 221a
See note 2 preceding 'Math' course descriptions.

Math 224a  F,W,S  3C  0.5
Linear Algebra 2
Linear transformations, eigenvalues, characteristic
polynomials, inner products.
Prereq: Math 124b
N.B.: Math 224a is not open to Honours
Mathematics students.

Math 224b  F,W,S  3C  0.5
Abstract Algebra 1
Elementary group and field theory and other topics
in algebra.
Prereq: Math 224a
N.B.: Math 224b is not open to Honours
Mathematics students.

Math 226  Y  2C  1.0
Elementary Differential Equations (For Science
Students)
An introduction to first order differential equations.
Applications to growth, decay, reactions. Linear
equations with constant coefficients. Systems of
equations: vector and matrix methods. Solutions in
series. Introduction to partial differential equations.
Prereq: Math 113 or Math 115a/b or equivalent
N.B.: Math 226 is not open to Honours or General
Mathematics students.

Math 230a  F,W  3C,1T  0.5
Advanced Calculus
Differential calculus of functions of several
variables: limits and continuity, partial derivatives,
derivative, 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 or 80% in Math 120a/b
N.B.: Credit will be granted for only one of Math
220a, 230a, 240a.
Also offered at St. Jerome's College.
Math 230b  F,W,S  3C,1T  0.5  
**Advanced Calculus**  
Prereq: Math 230a  
N.B.: Credit will be granted for only one of Math 220b, 230b, 240b.  
Also offered at St. Jerome's College.

Math 231a  
**Linear Algebra**  
A selection of topics from: vector spaces, systems of linear equations, transformations, matrices, inner products, determinants, invariant subspaces, canonical forms, bilinear forms, quadratic forms, and applications.  
Prereq: Math 134a/b or 80% in Math 124a/b  
See note 2 preceding 'Math' course descriptions.

Math 231b  
**Linear Algebra**  
A continuation of Math 231a.  
Prereq: Math 231a  
See note 2 preceding 'Math' course descriptions.

Math 234a  F,W  3C  0.5  
**Linear Algebra 2**  
Linear transformations, eigenvalues, characteristic polynomials, inner products.  
Prereq: Math 134b or 80% in Math 124b  
N.B.: Credit will be granted for only one of Math 224a, 234a, 244a.  
Also offered at St. Jerome's College.

Math 234b  F,W,S  3C  0.5  
**Abstract Algebra 1**  
Groups, fields and other topics in abstract algebra.  
Prereq: Math 234a  
N.B.: Credit will be granted for only one of Math 224b, 234b, 244b.  
Also offered at St. Jerome's College.

Math 240a  F,W  3C  0.5  
**Advanced Calculus**  
Math 240a is an advanced-level, enriched version of Math 230a.  
Prereq: Math 140b (or permission of instructor)  
N.B.: Credit will be granted for only one of Math 220a, 230a, 240a.

Math 240b  F,W,S  3C  0.5  
**Advanced Calculus**  
Math 240b is an advanced-level, enriched version of Math 230b.  
Prereq: Math 240a (or permission of instructor)  
N.B.: Credit will be granted for only one of Math 220b, 230b, 240b.

Math 241a  
**Linear Algebra**  
Math 241a is an advanced-level, enriched version of Math 231a.  
Prereq: Math 144b (or permission of instructor)  
See note 2 preceding 'Math' course descriptions.

Math 241b  
**Linear Algebra**  
Math 241b is an advanced-level, enriched version of Math 231b.  
Prereq: Math 241a (or permission of instructor)  
See note 2 preceding 'Math' course descriptions.

Math 244a  F,W  3C  0.5  
**Linear Algebra 2**  
Math 244a is an advanced-level, enriched version of Math 234a.  
Prereq: Math 144b (or permission of instructor)  
N.B.: Credit will be granted for only one of Math 224a, 234a, 244a.

Math 244b  F,W,S  3C  0.5  
**Abstract Algebra 1**  
Math 244b is an advanced-level, enriched version of Math 234b.  
Prereq: Math 244a (or permission of instructor)  
N.B.: Credit will be granted for only one of Math 224b, 234b, 244b.

Math 321a  S  2C,1T  0.5  
**Modern Algebra**  
Groups, monoids and Boolean algebras with selected applications.  
Prereq: Math 124a/b (Math 221a desirable)  
N.B.: Math 321a is not open to Honours Mathematics students.  
See note 2 preceding 'Math' course descriptions.

Math 321b  W  2C,1T  0.5  
**Modern Algebra**  
Rings and fields with selected applications.  
Prereq: Math 321a  
N.B.: Math 321b is not open to Honours Mathematics students.  
See note 2 preceding 'Math' course descriptions.
Math 322a  F,W,S  3C  0.5  
**Introduction to Real Analysis**
Elementary properties of the real number system including the completeness property and its relation to the concepts of limit, continuity and differentiability; mean value theorem; Riemann integration and the integrability of continuous and monotonic functions; uniform convergence, uniform continuity and their relation to the above. The emphasis will be on applications.  
Prereq: Math 220a (Math 220b desirable) 
N.B.: Math 322a is not open to Honours Mathematics students.

Math 322b  F,W  3C  0.5  
**An Introduction to Complex Variable Theory**
Complex numbers; continuity, differentiability, analyticity of functions; the Cauchy-Riemann equations; solutions of Laplace's equation; conformal mapping by elementary functions, and applications; the Cauchy and allied theorems; Taylor and Laurent expansions, uniform convergence and power series; the residue calculus, and applications. The emphasis will be on applications.  
Prereq: Math 220b 
N.B.: Math 322b is not open to Honours Mathematics students.

Math 324a  F,W,S  2C,1T  0.5  
**Linear Algebra 3**
Further topics in linear algebra and its application.  
Prereq: Math 224b 
N.B.: Math 324a is not open to Honours Mathematics students.

Math 324b  F,W  2C,1T  0.5  
**Abstract Algebra 2**
Topics in abstract algebra: groups, rings, fields and applications.  
Prereq: Math 224b 
N.B.: Math 324b is not open to Honours Mathematics students.

Math 331a  S  2C,1T  0.5  
**Modern Algebra**
Groups, monoids and Boolean algebras with selected applications.  
Prereq: Math 134a/b or 80% in Math 124a/b (Math 231a desirable) 
N.B.: Credit will be granted for only one of Math 321a, 331a, PMath 341a.  
See note 2 preceding 'Math' course descriptions.

Math 331b  W  2C,1T  0.5  
**Modern Algebra**
Rings and fields with selected applications.  
Prereq: Math 331a 
N.B. Credit will be granted for only one of Math 321b, 331b, PMath 341b.  
See note 2 preceding 'Math' course descriptions.

Math 332a  F,W,S  3C  0.5  
**Real Variables**
Prereq: Math 230a (Math 230b desirable) 
N.B.: Credit will be granted for only one of Math 322a, 332a, PMath 351a.

Math 332b  F,W  3C  0.5  
**An Introduction to Complex Variable Theory**
Complex numbers; continuity, differentiability, analyticity of functions; the Cauchy-Riemann equations; solution of Laplace's equation; conformal mapping by elementary functions, and applications; the Cauchy and allied theorems; Taylor and Laurent expansions, uniform convergence and power series; the residue calculus, and applications.  
Prereq: Math 230b 
N.B.: Credit will be granted for only one of Math 322b, 332b, PMath 352a.

Math 334a  F,W,S  2C,1T  0.5  
**Linear Algebra 3**
Further topics in linear algebra and its application.  
Prereq: Math 234b 
N.B.: Credit will be granted for only one of Math 324a, 334a.

Math 334b  F,W  2C,1T  0.5  
**Abstract Algebra 2**
Topics in abstract algebra: groups, rings, fields and applications.  
Prereq: Math 234b 
N.B.: Credit will be granted for only one of Math 324b, 334b, PMath 344.

Math 380a  F,S  2C,1T  0.5  
**Introduction to Information Theory with Applications**
Math 380b  W  2C,1T  0.5
Information Theory with Applications
Measures of expected conditional information. Maximizing expected conditional information. Applications to communication theory and programming. Basics in questionnaire theory.

Mathematics Electives

Course Descriptions

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 100  F,W,S  2C  0.5
Commercial Law for Mathematics Students
Prereq: None

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.
Prereq: None

MTHEL 206a  F,W  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, extra-curricular activities, the relationship between elementary and secondary school mathematics, audio-visual materials, current text books.
Prereq: None
N.B.: This course is offered only to students in the Co-op Math/Teaching Option.

MTHEL 302a  F  2C  0.5
Introduction to Biomathematics 1
Biometry is a biological discipline requiring both a knowledge of Mathematics and some basic understanding of specific biological phenomena. The course material has been selected from Genetics and Gerontology to provide examples of where both mathematics and biology have contributed to the advancement of knowledge in interdisciplinary areas.
Prereq: None
Cross listed with Health 302

MTHEL 302b  W  2C  0.5
Introduction to Biomathematics 2
A continuation of Biomathematics 1. Topics considered are first order reaction kinetics in biological systems including statistical considerations in enzyme kinetics, models for and the measurement of Evolution from a knowledge of genetics and protein structure and assessing the relative importance of environmental factors as evolutionary determinants.
Prereq: MTHEL 302a
N.B.: MTHEL 302b is cross listed with Health 303.

MTHEL 305a  F,W,S  3C  0.5
General Life Insurance 1
Types of Life Insurance contracts and their uses, basis of risk measurements, deficiency reserves, modified valuation methods, non-forfeiture values, dividend formulae, selection of risks, substandard risks, and principles of reinsurance.
Prereq: None

MTHEL 305b  W,S  3C  0.5
General Life Insurance 2
Legal aspects of life insurance, settlement options, principles of group and industrial insurance, organization and structure of life insurance companies, financial statements, the mathematics underlying insurance taxation.
Prereq: MTHEL 305a

MTHEL 402a  F  2C  0.5
Topics in Mathematical Aspects of Chemistry, Biology and the Medical Sciences 1
Topics will be selected from the area of epidemiology and mathematical models of disease processes with special reference to heart disease and cancer.
Prereq: MTHEL 302ab (or consent of the instructor)
Not offered 1981-82.

MTHEL 402b  W  2C  0.5
Topics in Mathematical Aspects of Chemistry, Biology and the Medical Sciences 2
Factors contributing to various disease processes will be discussed with special references to the quantitative evaluation of environmental factors relevant to human disease and aging processes.
Prereq: MTHEL 302ab and 402a (or consent of the instructor)
Not offered 1981-82
Pure Mathematics

Course Descriptions

Note
More detailed course descriptions and course outlines are available upon request from the Pure Mathematics Department.

P Math 230a F 2C,1T 0.5
Introduction to Pure Mathematics
Ideas 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

P Math 230b W 2C,1T 0.5
Introduction to Pure Mathematics
Similar to, but independent of PMath 230a.
Prereq: None

P Math 344 F 3C 0.5
Algebra
Groups, rings, fields and applications.
Prereq: Math 244b or consent of instructor.
N.B.: PMath 344 may be substituted for Math 334b whenever this is a requirement in an Honours programme.

P Math 351a F,S 2C,1T 0.5
Real Analysis
Theory of functions of real variables. The notions of compactness, connectedness and uniformity are used in a study of continuity, differentiation, and integration.
Prereq: Math 230a/b
N.B.: P Math 351a may be substituted for Math 332a whenever this is a requirement in an Honours programme.

P Math 351b W 2C,1T 0.5
Real Analysis
Continuation of PMath 351a.
Prereq: PMath 351a

P Math 352a F,S 2C,1T 0.5
Complex Analysis
Holomorphic functions, Cauchy's integral theorem, Cauchy's integral formulas, Taylor and Laurent expansions, classification of isolated singularities, the Residue theorem.
Prereq: Math 230ab
N.B.: P Math 352a may be substituted for Math 332b whenever this is a requirement in an Honours programme.

P Math 352b W 2C,1T 0.5
Complex Analysis
Continuation of PMath 352a.
Prereq: P Math 352a

P Math 360 Geometry
Not offered 1987-82

P Math 365 F 2C,1T 0.5
Elementary Differential Geometry and Tensor Analysis
Curves in Euclidean 3-space ($E^3$) and the Serret-Frenet formulae; surfaces in $E^3$ and their intrinsic geometry, Gaussian curvature and the Gauss-Bonnet theorem. Coordinate transformations and tensors in n-dimensions, n-dimensional Riemannian spaces, covariant differentiation, geodesics, the curvature, Ricci and Einstein tensors. Applications of tensors in Relativity and Continuum Mechanics.
Prereq: Math 230ab, or consent of instructor.
N.B.: Cross listed with AM 362.

P Math 367 W 3C 0.5
Set Theory and General Topology
Intuitive set theory, metric spaces, point set topology.
Prereq: Math 230a

P Math 399 Readings in Pure Math

P Math 430a F,S 2C,1T 0.5
Introduction to Mathematical Logic
N.B.: This course will be of interest to all math students. Credit will only be granted for one of P Math 430a or 432a.
Course Descriptions
Pure Mathematics

P Math 430b W 2C,1T 0.5
Introduction to Mathematical Logic
Continuation of P Math 430a. Gödel's incompleteness theorem (in outline). Logicism, intuitionism, formalism. Selected topics (some of intuitionistic logic, modal logic, the representation theorem for Boolean Algebras normally are treated).
Prereq: P Math 430a
N.B.: This course will be of interest to all math students. Credit will only be granted for one of P Math 430b or 432b.

P Math 432a F 2C 0.5
Mathematical Logic
First order languages and theories. This course is more specialized and at a more advanced level than P Math 430.
N.B.: Credit will only be granted for one of P Math 430a or 432a.
Offered alternate years.

P Math 432b W 2C 0.5
Mathematical Logic
Continuation of P Math 432a. A treatment of at least one of the following: set theory, model theory, undecidability.
Prereq: P Math 432a
N.B.: Credit will be granted for only one of P Math 430b or 432b.
Offered alternate years.

P Math 441a F 2C 0.5
Introduction to Number Theory
Elementary Theory of Numbers, quadratic reciprocity, applications to Diophantine equations.
Prereq: Third or fourth year standing or consent of instructor.
N.B.: This course will be of interest to all honours math students.

P Math 441b W 2C 0.5
Number Theory
Continuation of P Math 441a.
Prereq: Math 334b or P Math 344, and P Math 441a

P Math 443 Linear Algebra 2
Not offered 1981-82

P Math 445 F 2C 0.5
Ring Theory
Continuation of the theory of rings and modules.
Prereq: Math 334a/b or P Math 344
Offered in Fall 1982.

P Math 446 W 2C 0.5
Group Theory
Permutations, Cayley Theorem, Sylow Theorem, Jordan-Holder Theorem, nilpotent and solvable groups, direct and semidirect products, free groups.
Prereq: Math 334b or P Math 344
Offered in Winter 1982 and Fall 1983.

P Math 447 F 2C 0.5
Field Theory
Field extensions and Galois theory.
Prereq: Math 334b or P Math 344
Offered in Fall 1981 and Winter 1983.

P Math 451a F 2C 0.5
Measure and Integration
An introduction to integration and measure theory with emphasis on the real line.
Prereq: Math 332a or P Math 351a/b

P Math 451b W 2C 0.5
Functional Analysis
Banach spaces and linear operators.
Prereq: P Math 451a

P Math 452a Complex Analysis 2a
Not offered 1981-82

P Math 452b Complex Analysis 2b
Not offered 1981-82

P Math 461 Finite Geometries
Not offered 1981-82

P Math 463 F 2C,1T 0.5
Differentiable Manifolds
Differentiable manifolds, vector fields, linear connections, tensor fields, differential forms and structure equations.
Prereq: P Math 365/AM 362 or consent of instructor
N.B.: Cross listed with AM 463.

P Math 465 W 2C,1T 0.5
Selected Topics in Differential Geometry
Topics from pseudo-Riemannian and Riemannian geometry such as: isometries and Killing vector fields; sectional curvatures; submanifolds; normal co-ordinates; variation of geodesics and Jacobi fields; conformally related spaces.
Prereq: P Math/AM 463 or consent of instructor.
N.B.: Cross listed with AM 474.

P Math 467 W 2C 0.5
Topology
Topics from algebraic, combinatorial and geometric topology.
Prereq: P Math 367
Offered in Winter 1982 and Fall 1982.
Statistics

Course Descriptions

Stat 202 F 2C,1L 0.5
Elementary Statistics for Biologists
Elementary probability, populations, samples and distributions with biological examples. Methods for data summary and presentation including an introduction to interactive programming. Estimation, hypothesis testing, two-sample techniques and paired comparisons. Contingency tables.
Prereq: None
N.B.: Stat 202 is for Science Students only.

Stat 204 F 2C,1L 0.5
Statistics for the Physical Sciences 1
Prereq: None
N.B.: Stat 204 is for Science Students only.

Stat 205 W 2C,1L 0.5
Statistics for the Physical Sciences 2
Prereq: Stat 202 or 204
N.B.: Stat 205 is for Science Students only.

Stat 210 F,W 3C,1T 0.5
Applied Probability and Statistics
Prereq: Math 110a/b
N.B. This course is for students in Mechanical Engineering, and is cross listed in Management Sciences as M Sci 21.

Stat 220 F,W,S 3C,1T 0.5
Introduction to Statistical Methods
Probability theory; discrete and continuous random variables, expectation.
Prereq: Math 120a/b, one of CS 116, CS 118, CS 140
N.B.: Stat 220 is not open to Honours Mathematics students. Credit will be given for only one of Stat 220, 230.

Stat 221 F,W,S 3C,1T 0.5
Introduction to Statistical Methods 2
Tests of significance, maximum likelihood estimation and large sample theory; estimation and testing in the normal distribution. Correlation, regression and the method of least squares.
Prereq: Stat 220
N.B.: Stat 221 is not open to Honours Mathematics students. Credit will be given for only one of Stat 221, 231.

Stat 230 F,W,S 3C,1T 0.5
Probability
The laws of probability, discrete and continuous random variables, expectation, central limit theorem.
Prereq: Math 120a/b
N.B.: Credit will be given for only one of Stat 220, 230.

Stat 231 F,W,S 3C,1T 0.5
Statistics
Estimation, tests of significance, probability plots. Contingency tables, normal distribution theory, simple linear regression.
Prereq: Stat 230
N.B.: Credit will be given for only one of Stat 221, 231.

Stat 300 F,W 2C,1T 0.5
Principles of Survey Design
The design of surveys of human or natural populations for research and planning. How to take a representative sample; efficient estimation of population quantities and sample size determination; ways of reducing response bias.
Prereq: An introductory half course in statistics.
N.B.: Stat 300 cannot be taken for credit toward a BMath degree.

Stat 330 F,W 3C 0.5
Introduction to the Theory of Statistics
Prereq: Stat 221 or equivalent
N.B.: Credit will be given for only one of Stat 330, 350.
Stat 331  F,W,S  3C  0.5  
**Applied Regression Analysis**
Review of Normal, t, Chi-squared and F distributions and their applications. Introduction to the design of experiments. Analysis of variance, multiple linear regression.  
Prereq: Stat 221 or the equivalent.  
N.B.: Credit will be given for only one of Stat 331, 351.

Stat 332  F,S  3C  0.5  
**Sampling**
Introduction to survey sampling of populations. Elementary sampling designs. Efficiency comparisons for sampling designs and estimation procedures.  
Prereq: Stat 221 or the equivalent  
N.B.: Credit will be given for only one of Stat 332, 454.

Stat 333  F,W,S  3C  0.5  
**Applied Probability**
Prereq: Stat 230 or Stat 220/221

Stat 334  F,W  3C  0.5  
**Probability and Stochastic Processes**
Prereq: Stat 333 or consent of instructor

Stat 350  F,W,S  3C  0.5  
**Mathematical Statistics**
Continuous random variables; moments and moment generating function; distribution of t, chi-squared, and F, and their applications. Large sample theory.  
Prereq: Math 230a/b, Stat 231 or consent of instructor.  
N.B.: Credit will be given for only one of Stat 330, 350.

Stat 351  F,W  3C  0.5  
**Regression Analysis**
The multivariate normal distribution, its properties and uses; quadratic forms and Cochran’s theorem; multiple regression; introduction to the analysis of variance.  
Prereq: Stat 350, Math 234a/b  
N.B.: Credit will be given for only one of Stat 331, 351.

Stat 430  F,S  2C  0.5  
**Experimental Design 1**
The requirements for a good experimental design prior to the accumulation of data. The concepts of randomization, replication and experimental errors as applied to basic designs; the completely randomized block and latin square designs. Analysis of variance. Introduction to factorial designs.  
Prereq: Stat 331 or 351 or consent of instructor.  
N.B.: Credit will be given for only one of Stat 430, 452.

Stat 431  W  2C  0.5  
**Experimental Design 2**
Factorial experiments, confounding, fractional replication. Applications of designs. Incomplete block designs. Analysis of covariance.  
Prereq: Stat 430  
N.B.: Credit will be given for only one of Stat 431, 452.

Stat 440  W  2C  0.5  
**Exploratory Data Analysis**
Prereq: Stat 331 or 351, and an ability to programme in FORTRAN.

Stat 442  W  3C  0.5  
**Statistical Decision Theory**
The decision problem; Bayesian and classical analyses; acceptance sampling; sequential procedures; an introduction to the statistical aspects of quality control.  
Prereq: Stat 221, Stat 330 recommended.  
N.B.: Credit will be given for only one of Stat 442, 450.

Stat 444  S  2C,1S  0.5  
**Statistical Methods with Socio-Economic Applications 1**
Prereq: Stat 331 or 351.

Stat 445  Statistical Methods with Socio-Economic Applications 2
Continuation of Stat 444.  
Prereq: Stat 444  
N.B.: May or may not be offered in 1981-82
Stat 450  F  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 350
N.B.: Credit will be given for only one of Stat 442, 450.

Stat 451  W  2C  0.5
Topics in Statistical Inference
Logic of tests of significance; exact tests and confidence intervals; normal approximations accurate for small samples and relationship to the normality of the likelihood function. Introduction to problems involving more than one parameter.
Prereq: Stat 450 or consent of instructor

Stat 452  F,S  3C  0.5
Theory of Experimental Design 1
Logical requirements of designed experiments. Design and analysis of basic complete designs with fixed effects, random effects, or both. Analysis of covariance. Latin squares. Applications.
Prereq: Stat 331 or 351 or consent of instructor
N.B.: Credit will be given for only one of Stat 430/431, 452.

Stat 453  Theory of Experimental Design 2
Not offered 1981-82

Stat 454  W  3C  0.5
Sampling Theory and Practice
Introduction to sample theory and practice. Elementary sampling and designs and estimation procedures. Statistical inference in survey sampling. Interrelationships between survey sampling and the design of experiments.
Prereq: Stat 331 or 351
N.B.: Credit will be given for only one of Stat 332, 454.

Stat 455  Sample Survey Design
Not offered 1981-82

Stat 464  W  2C  0.5
Topics in Probability Theory
Prereq: Stat 333/4 or consent of instructor
N.B.: May or may not be offered 1981-82

Stat 466  Topics in Statistics 1
Prereq: Stat 350/1 or consent of instructor
N.B.: May or may not be offered 1981-82

Stat 467  Topics in Statistics 2
N.B.: May or may not be offered 1981-82

Stat 468  0.5
Readings in Statistics 1

Stat 469  0.5
Readings in Statistics 2

Stat 500  W  2C,1T  0.5
Principles of Survey Design
The design of surveys of human or natural populations for research and planning. How to take a representative sample; efficient estimation of population quantities and sample size determination; ways of reducing response bias.
Prereq: An introductory half course in statistics
N.B.: Stat 500 is intended for senior undergraduates and graduate students in faculties other than Mathematics. It cannot be taken for credit towards a Mathematics degree.
May or may not be offered in 1981-82

Stat 520  Introduction to Mathematical Statistics
N.B.: May or may not be offered 1981-82.
Course Descriptions
Mechanical Engineering

Associate Professors
K. G. Adams, BSc (Queen's), MASc, PhD (Waterloo), PEng
G. C. Andrews, BASc, MASc (Br. Col.), PhD (Waterloo), PEng
G. A. Davidson, BASc (Hons), PhD (Toronto), PEng
A. M. Hale, BSc, MA (New Br.), BASc (Toronto), MASc, PhD (Waterloo), PEng
U. H. Mohaupt, BASc, MASc, PhD (Waterloo), PEng
R. J. Pick, BASc (Br. Col.), MSc (Imperial College), PhD (Waterloo), PEng
H. F. Sullivan, BASc (Waterloo), AM, PhD (Princeton), PEng

Assistant Professors
J. A. Amini, Nat Ing (Delft), Dipl., Dr Ing (Grenoble)
G. E. Schneider, BASc, MASc, PhD (Waterloo)

Adjunct Professor
J. W. Church, BSc (Queen's, Kingston), MASc (Toronto)
R. G. R. Lawrence, QC

Undergraduate Programmes
Details of the undergraduate programme in Mechanical Engineering are to be found in Chapter 9. All courses extend over one term only, and consist of 3 hours of lectures per week unless otherwise specified. In general, the only prerequisites are the core courses, unless otherwise specified.

Course Descriptions
M E 100 F,W 3C 0.5
Introductory Survey of Law
The rights and responsibilities of the engineer as a citizen of Ontario and Canada under the law; brief history of Canadian law differentiating between Civil and Criminal Law, the rights and duties of citizens and police, a review of Domestic Law, Real Estate Law, Landlord and Tenant Law. The law as it may pertain to the engineer in his profession, brief reviews of the Laws of Contracts, Patents, Trade marks, industrial design, and copyright, Bills of Exchange, Company Law, Incorporation of companies. Common and Preferred shares, the Law of Master and Servant, Surveying Law, Constitutional Law, Private International Law, and other topics. This course is restricted to senior Mechanical Engineering students.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Type</th>
<th>Credits</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME 116</td>
<td>W,S</td>
<td>2C,4L</td>
<td>0.75</td>
</tr>
<tr>
<td>Engineering Concepts 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ME 200</td>
<td>F,W</td>
<td>1C</td>
<td>0.0</td>
</tr>
<tr>
<td>Introduction to Mechanical Engineering 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ME 201</td>
<td>F,W</td>
<td>3C,1T</td>
<td>0.5</td>
</tr>
<tr>
<td>Advanced Calculus</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ME 202</td>
<td>F,W</td>
<td>3C,1T</td>
<td>0.5</td>
</tr>
<tr>
<td>Statistics for Engineers (Equivalent to M Sci 21)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ME 203</td>
<td>S,F</td>
<td>3C,1T</td>
<td>0.5</td>
</tr>
<tr>
<td>Ordinary Differential Equations</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ME 204</td>
<td>S,F</td>
<td>3C,1T</td>
<td>0.5</td>
</tr>
<tr>
<td>Numerical Analysis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ME 212</td>
<td>F,W</td>
<td>3C,1T</td>
<td>0.5</td>
</tr>
<tr>
<td>Dynamics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ME 215</td>
<td>F,W</td>
<td>3C,3L</td>
<td>0.5</td>
</tr>
<tr>
<td>Structure and Properties of Materials</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ME 219</td>
<td>F,W</td>
<td>2C,1D,1T</td>
<td>0.5</td>
</tr>
<tr>
<td>Mechanics of Deformable Solids 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ME 220</td>
<td>S,F</td>
<td>2C,1D,1T</td>
<td>0.5</td>
</tr>
<tr>
<td>Mechanics of Deformable Solids 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ME 230</td>
<td>S,F</td>
<td>3C,3L</td>
<td>0.5</td>
</tr>
<tr>
<td>Control of Properties of Materials</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**ME 116 W,S 2C,4L 0.75**

Engineering Concepts 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

Infinite series: Tests for absolute, conditional, uniform convergence; power series; series expansions; differentiation and integration. Partial differentiation: total derivatives; estimation of errors; chain rule; geometry; maxima and minima; Taylor series; Jacobians. Multiple integration: areas, centroids, moments of inertia, centres of gravity. Vector analysis: gradient divergence, curl, Laplacian; integral theorems.

**ME 202 F,W 3C,1T 0.5**

Statistics for Engineers (Equivalent to M Sci 21)


**ME 203 S,F 3C,1T 0.5**

Ordinary Differential Equations


**ME 204 S,F 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.

**ME 212 F,W 3C,1T 0.5**

Dynamics


**ME 215 F,W 3C,3L 0.5**

Structure and Properties of Materials

The relevance of materials to engineering practice. The microstructure of materials, crystallinity and crystal imperfections, glasses and amorphous solids. Elastic and plastic deformation in metals, viscoelasticity of plastics, fracture of brittle and ductile solids. Electrical and magnetic properties of materials.

**ME 219 F,W 2C,1D,1T 0.5**

Mechanics of Deformable Solids 1


**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 super-position, energy theorems, theories of failure, elastic and inelastic analysis of symmetrical bending, torsion of circular members, columns and stability, and virtual work.

**ME 230 S,F 3C,3L 0.5**

Control of Properties of Materials

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Offered</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
</table>
| ME 250      | S,F     | 3C,1L   | Thermodynamics  
| ME 300      | S,W     | 1C      | 0.0         | Introduction to Mechanical Engineering 2  
Technical specialties in Mechanical Engineering, discussion of options in Mechanical Engineering curriculum, seminars and technical topics in the various options. |
| ME 305      | S,W     | 3C,1T   | 0.5         | Partial Differential Equations  
| ME 321      | S,W     | 3C,1L   | 0.5         | Kinematics and Dynamics of Machines  
| ME 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. |
| ME 340      | S,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. |
| ME 351      | S,W     | 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. |
| ME 353      | F,W     | 3C,2T,1L| 0.5         | Heat Transfer 1  
Introduction to heat transfer mechanisms. The formulation and solution of steady and transient heat conduction. Radiant heat transfer including exchange laws and view factors. Introductory convective heat transfer. |
| ME 354      | S,W     | 3C      | 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. |
| ME 360      | F,W     | 3C,2T,1L| 0.5         | Introduction to Control Systems  
| ME 362      | F,W     | 3C,1T,1L| 0.5         | Fluid Mechanics 2  
Basic equations of two-dimensional flow, exact viscous solutions, introduction to lubrication, boundary layers, and introduction to turbulence. Turbomachinery fundamentals and applications. Selected advanced topics. |
| ME 400      | S,F     | 1C      | 0           | Introduction to Mechanical Engineering 3  
Research frontiers in Mechanical Engineering, specific discussion of research done at Waterloo, seminars by members of research group. |
ME 423  F, S  3C, 1T  0.5
**Mechanical Design 2**
This is a continuation of the ME 322 course in analysis and synthesis of machinery, including advanced analysis of machine elements such as clutches, brakes, couplings, journal bearings and gears. The latter part of the course includes 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.
*Prereq: ME 322*

ME 432  F, S  0.5
**Physical Metallurgy of Deformation and Fracture**
Microscopic origins of elastic and an elastic 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, W  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 443  W  3C  0.5
**Metal Casting Processes**

ME 448  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.

ME 452  W  3C  0.5
**Energy Transfer in Buildings**
Thermodynamic properties of moist air; psychometric 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  S, F  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 462  S, F  3C, 2T, 3L  0.5
**Introduction to Automation**
Number systems, Codes and Coding, minimization techniques applied to design of logic systems. Comparison of microprocessors, memories, input/output logic elements; design and application of Digital systems for data collection, and control of pneumatic, hydraulic and mechanical systems; comparison of software and hardware techniques in such applications.
Mechanical Engineering

M E 463  F,W  3C  0.5
Tribology 1
The science of friction, lubrication and wear. The
topography and contact mechanics of real surfaces.
The measurement of friction and wear. Friction and
wear theories for elastic and plastic contact.
Lubrication mechanisms: hydrostatic, hydrodynamic,
elastohydrodynamic, boundary, extreme pressure,
and solid film. Physical and chemical properties of
lubricants. Bearings and their selection.

M E 469  F,W  3C  0.5
Introduction to the Environmental Sciences
Composition and structure of the atmosphere and
oceans. Thermodynamics of moist air. Hydrostatic
equation. Stability. Winds and current on a rotating
earth gradient, geostrophic and inertial flow. Vertical
variation of wind, convection, thermals, plumes,
basic diffusion theory-coastal currents, gulf streams,
tides, internal waves.

M E 482  S,F,W  9L  0.5
Mechanical Engineering Projects
Engineering assignments requiring the student to
demonstrate initiative and assume responsibility.
Student activity is guided and co-ordinated by a
faculty supervisor. In selecting projects, particular
account is taken of the student's field of
specialization. Projects, in general, involve technical
disciplines beyond the strictly mechanical
engineering field.

M E 524  W  3C,1T  0.5
Advanced Dynamics and Stress Analysis in Design
This course is related to M E 423, although M E 423
is not an essential prerequisite. M E 524 brings
together dynamics and stress analysis in an
application to design of dynamic machinery. Basic
kinematic and dynamic concepts are reviewed and
extended. Lagrangian and computer simulation
methods are introduced. Basic stress analysis
methods are reviewed and indeterminate structures
are discussed, along with finite-element and other
computer techniques. A design project (involving
synthesis), utilizing the concepts studied, is usually
included.

M E 525  F,S  3C  0.5
Mechanical Vibrations in Machines
Fundamentals of mechanical vibration. Forced,
transient and nonlinear vibrations. Numerical
methods for multi-degree-of-freedom systems.
Continuous systems. Vibration isolation.
Measurement of vibration. Use of models and the
analogue computer.

M E 527  W  3C  0.5
Mechanics of Deformable Solids 3
Analysis of stress and strain in three dimensions,
plates and shells, stress functions, plastic stress-
strain concentrations. Residual stress, thermal
stress and creep. Energy methods.

M E 531  F,S  3C  0.5
Physical Metallurgy of Structures and
Transformations
Nucleation and growth in metals. Diffusion and
sintering. Fundamental aspects of condensed phase
equilibrium in binary and ternary metal systems.
Non-equilibrium in metal systems. Surface
phenomena. Corrosion and oxidation in metals.
Applications to industrial metals and alloys.

M E 534  W  3C  0.5
Non-metallic Materials
Structure of amorphous and crystalline plastics.
Polymerization, control of properties of plastics by
crosslinking and additives. Glasses, properties of
fibers, refractories, abrasive materials, oxides,
carbides, properties and applications of graphite.
Brittle fracture, viscoelasticity and rheological
models.
Course Descriptions
Mechanical Engineering

M E 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.

M E 561 S,F 3C 0.5
Fluid Power Control Systems

M E 563 W 3C 0.5
Turbomachines

M E 565 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 methods of characteristics.

M E 568 W 3C 0.5
Noise Analysis and Control

M E 569 S,F 3C 0.5
Fluid Mechanics-Design Topics
A study of the design aspects of fluid mechanics, Unsteady flow, pipe and duct systems, two and three dimensional flow techniques, practical calculation of boundary layers, separation, base pressures, jets, wakes and shear layers, diffusers and flow distribution devices, flow control, two-phase flow, instrumentation, wind tunnel modelling, wind loading. The course will be oriented to practical design techniques for flow systems, reactors, air pollution control equipment, etc.

M E 571 S,F 3C 0.5
Air Pollution 1
Nature and sources of air pollution, chemical and biological aspects, effects on health and environment. Physical aspects of the atmosphere, thermodynamics, vertical variation of wind and temperature, stability, convection, atmospheric turbulence, diffusion equations, plumes, thermals, jets in stratified flow, radioactive plumes, particulate dispersion, instrumentation (micrometeorological), air pollution control techniques and equipment monitoring instrumentation.

M E 566 S,F 3C 0.5
Fluid Mechanics 3
Music

Associate Professor, Chairman of the Department
W. R. Maust, BS (EMC), BMus (Peabody Conservatory), MMus, PhD (Indiana)

Associate Professor
H. Martens, ARCT, LRSM, BA, MA (Minnesota), PhD (Columbia)

Lecturers
L. Enns, ARCT, BSM (CMBC), BMus (Wat. Luth.) MMus (Northwestern)
K. Hull, ARCT, BA (Waterloo), BMus, MMus (W. Ont.)

Part-Time Lecturers
D. Harrison, BIS (Waterloo)
M. Jarrett
A. Martin, ARCT, BMus (Toronto), MMus (Eastman)

Course Descriptions

Music 100G F,W,S 3C 0.5
The Basics of Music
An introduction to music terminology, techniques and styles, through lectures and listening, with examples from all eras of music history.

Music 101G F 2L 0.25
Music Ensemble
The study of selected music literature through rehearsals and performance in one of the Music Department's ensembles: Choir, Concert Band, Orchestra. Regular attendance at rehearsals and performances is required. Offered on a pass/fail basis.

Music 102G W 2L 0.25
Music Ensemble
(See Music 101G for course description)

Music 125G F 3C 0.5
Popular Music and Culture
An examination of the popular music world and the interplay between rock, folk, jazz and gospel idioms and classical music. The social, commercial and technological elements of popular music are considered.

Music 150G F 3C 0.5
Introduction to Music I
An introduction to music from early Christian chant to Beethoven through listening, lectures, discussion and analysis.

Music 151G W 3C 0.5
Introduction to Music II
An introduction to 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 150G or consent of instructor.

Music 160G Choral Literature 1
Not offered in 1981-82

Music 161G Choral Literature 2
Not offered in 1981-82

Music 201G F 2L 0.25
Music Ensemble
(See Music 101G for course description)

Music 202G W 2L 0.25
Music Ensemble
(See Music 101G for course description)

Music 250G F,S 3C,1L 0.5
Music Theory 1 (Medieval and Renaissance)
The study of scales, melody, two-part counterpoint, and basic harmonic concepts emphasizing the Middle Ages and Renaissance. Ear-training and sight-singing lab sessions will cover diatonic melodic and simple two-part exercises.
Prereq: A basic knowledge of scales, triads, and musical notation.

Music 251G W 3C,1L 0.5
Music Theory 2 (Baroque and Classical)
The study of four-part homophonic and contrapuntal music, of diatonic and simple chromatic harmonics, and of elementary forms, emphasizing Baroque and Classical music. Ear-training and sight-singing lab sessions will cover four-part diatonic exercises.
Prereq: Music 250G or permission of the instructor.

Music 253G F 3C 0.5
Medieval and Renaissance Music
The study of music that flourished under courtly and church patronage from the early Christian Church to 1600. Gregorian chant, liturgical drama, mass, motet, secular songs, and instrumental music are studied.
Prereq: Music 150G and Music 151G or Music 100G or consent of the instructor.
Music 254G  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 150G and Music 151G or Music 100G or consent of the instructor.

Music 262G  W  2C,2L  0.5  
**Instrumental Literature 1**
A study of the music written for a variety of instrumental groups, such as chamber music, symphony, concerto. The course includes a laboratory component.
Prereq: Music 150G/151G or Music 100G or permission of instructor.

Music 263G  **Instrumental Literature 2**
Not offered in 1981-82

Music 266G  F,W  std  0.5  
**Music Studio**
Private music studio in Voice, Piano, Organ, Classical Guitar and orchestral instruments. This course is available only to Music majors and minors.
Prereq: Audition with Music Faculty. Studio Fee.

Music 267G  F,W  std  0.5  
**Music Studio**
(See Music 266G for course description.)
Prereq: Music 266G and consent of Music Faculty. Studio Fee.

Music 273G  F,W,S  3C  0.5  
**Traditional Folk Music**
A delineation of the characteristic motifs in folk music as found in Great Britain, Canada, the United States and Australia. Various folk instruments will be introduced.

Music 274G  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 275G  W,S  3C  0.5  
**Computer Applications in Music**
A survey of computer applications in music history, analysis and composition. Concepts from computer science and specific techniques and implementations of these various music activities are examined. Theoretical study is coupled with practical hands-on experience.
Prereq: Music 100G or 150G/151G or consent of instructor.

Music 280G  F  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 150G/151G or Music 100G or consent of instructor.

Music 301G  F  2L  0.25  
**Music Ensemble**
(See Music 101G for course description)

Music 302G  W  2L  0.25  
**Music Ensemble**
(See Music 101G for course description)

Music 353G  
**Music of the Romantic Period (19th Century)**
Not offered in 1981-82

Music 354G  
**Music of the Twentieth Century**
Not offered in 1981-82

Music 355G/356G  S  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 150G/151G or Music 100G or consent of instructor.

Music 360G  
**Music of the Church**
Not offered in 1981-82

Music 361G  
**Music of the Church**
Not offered in 1981-82

Music 366G  F,W  std  0.5  
**Music Studio**
(See Music 266G for course description.)
Prereq: Music 267G and consent of Music Faculty. Studio Fee.

Music 367G  F,W  3C,1L  0.5  
**Music Studio**
(See Music 266G for course description.)
Prereq: Music 366G and consent of Music Faculty. Studio Fee.
Music 370G  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 250G/251G or consent of instructor.

Music 371G  W  3C,1L  0.5
Music Theory 4 (20th Century)
The study of the compositional aspects of 20th century music, including extended tonality, atonality, 12-tone writing, neo-classical idioms, and contemporary compositional procedures. Lab sessions will cover non-tonal melodic reading and complex chord structures.
Prereq: Music 370G.

Music 372G Choral Music, Repertoire and Techniques 1
Not offered in 1981-82

Music 373G Choral Music, Repertoire and Techniques
Not offered in 1981-82

Music 380G/381G  F,W  0.5/0.5
Directed Study in Music
Prereq: Advanced standing in music and consent of instructor.

Music 466G  F  std  0.5
Music Studio
(See Music 266G for course description.)
Prereq: Music 367G and consent of Music Faculty. Studio Fee.

Music 467G  W  std  0.5
Music Studio
A continuation of Music Studio. A recital is required.
Prereq: Music 466G and consent of Music Faculty. Studio Fee.

Music 490G/491G  F,W  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).

School of Optometry

Professor, Director of School
M. E. Woodruff, OD (College of Optometry of Ontario)
PhD (Indiana)

Associate Professor, Associate Director
T. D. Williams, OD (College of Optometry of Ontario),
MS, PhD (Indiana)

Professors
W. K. Adrian, Dipl-Ing, Dr-Ing, (TH Darmstadt),
Dr habil, apl Professor (Karlsruhe)
C. W. Bobier, OD (College of Optometry of Ontario),
BA (Toronto), MSc (Ohio State)
E. J. Fisher, BA, MA (Toronto), DSc (Penn. College of Optometry)
W. S. Long, OD (College of Optometry of Ontario),
BA (Toronto)
W. M. Lyle, OD (College of Optometry of Ontario),
MS, PhD (Indiana)
R. D. Pellowe, OD (College of Optometry of Ontario)
J. G. Sivak, LScO (Montreal), MS (Indiana),
PhD (Cornell)
G. C. S. Woo, OD (College of Optometry of Ontario),
MS, PhD (Indiana) LOSc (Melbourne)

Associate Professors
R. D. Beauchamp, BA (McMaster), MA PhD (Brown)
M. G. E. Callender, OD (College of Optometry of Ontario),
BSc (Sir G Wms), MSc (Waterloo)
A. P. Cullen, DiplOpt (City Univ. London), MSc (Sask),
OD (Penn College of Optom), PhD (City Univ. London), DCLP
A. R. Remole, OD (College of Optometry of Ontario),
BFA (Manitoba), MS, PhD (Indiana)

Assistant Professors
J. V. Lovasik, BSc (McGill), OD, MSc, PhD (Waterloo)

Adjunct Professors
D. E. Andrew, BA, MD (Toronto)
I. Baker, OD (College of Optometry of Ontario)
D. H. Lamont, BA (Toronto), QC
G. W. Wyszecki, Dipl Ing, Dr Ing (Tech. Univ. Berlin)

Adjunct Lecturers
E. E. Daniel, BA, MA (Johns Hopkins), PhD (Utah)
T. R. Jones, BSc, MSc, PhD (Western)

Lecturers
B. Robinson, OD (Waterloo) MPH (Washington)
M. J. Samek, OD (College of Optometry of Ontario),
MSc (Waterloo)
Course Descriptions

Optometry

Professor, Chief of Clinical Services
R. D. Pellowe, OD (College of Optometry of Ontario)

Clinic Supervisor, Associate Chief of Clinical Services
D. B. Buck, OD (College of Optometry of Ontario)

Clinic Supervisors - Full time (1980-1981)
P. Chapman, OD (Waterloo)
D. J. Egan, BSc (St. Johns Univ), OD (Penn. College of Optometry)
S. Hoffman, MD, DPH (Toronto)
J. O. LaMotte, OD (New Eng. College of Optometry), MS (Washington), PhD (Arizona)
R. Pace, OD (Waterloo)

W. B. Andrews, OD (Waterloo)
W. R. Andrews, OD (College of Optometry of Ontario)
A. J. Baldock, OD (College of Optometry of Ontario)
W. R. Bobier, BSc (Queen's), OD (Waterloo)
D. Bock, OD (Waterloo)
R. R. Bock, OD (College of Optometry of Ontario)
M. Boermans, OD (Waterloo)
J. A. Brisson, OD (Waterloo)
J. E. Chantry, OD (Waterloo)
R. R. Chen, OD (College of Optometry of Ontario)
K. S. Chhatwal, OD (Waterloo)
R. Chou, BSc (Toronto), OD (Waterloo)
D. S. Craig-Paul, OD (Waterloo)
G. M. Curik, OD (Waterloo)
C. C. Datziel, OD (Waterloo)
P. A. Devenny, OD (Waterloo)
A. H. Dick, OD (Waterloo)
T. A. Dietrich, OD (Waterloo)
M. H. Falke, OD (Waterloo)
P. Galvin, OD (Waterloo)
G. A. Grant, OD (College of Optometry of Ontario)
D. A. K. Hayhoe, OD (Waterloo)
G. L. Hollands, OD (Waterloo)
L. Hiranu, OD (Waterloo)
D. Klein, OD (Waterloo)
S. K. Kovacs, OD (Waterloo)
L. Markaryan, OD (Waterloo)
J. M. McDowell, OD (Waterloo)
R. E. Miller, BSc (Toronto), OD (Waterloo)
P. Monk, OD (Waterloo)
D. A. Neff, OD (Waterloo)
J. Parks, OD (Waterloo)
K. Pickard, OD (Waterloo)

B. H. Rice, OD (Waterloo)
R. L. Saari, OD (Waterloo)
P. Shaw, OD (Waterloo)
L. Sheldon, OD (Waterloo)
M. Sherk, OD (Waterloo)
J. S. Smitbert, OD (Waterloo)
P. Sohier, OD (Waterloo)
M. Teeple, OD (Waterloo)
D. Thornborrow, OD (Waterloo)
R. Watson, OD (College of Optometry of Ontario)
R. L. Wilson, OD (Waterloo)
M. Witter, OD (Waterloo)
S. Woodruff, OD (Waterloo)
W. R. Woolner, OD (Waterloo)

Clinic Resident (1980-1981)
T. W. Shek, BS (San Francisco), MS, OD (Houston)

Course Descriptions

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 ultra structure 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.
Coreq: Biol 201

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.
Prereq: Biol 201, Optom 104
Optom 106  F  3C,3L  0.5
Geometrical Optics
Prereq: Phys 121, 121L, 122, 122L, Math 113

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
Optometrical Optics
Properties of ophthalmic glass and lenses, cylindrical lenses, prisms, prismatic effects, lens combinations. Laboratory work involves processing prescriptions and experiments in optics.

Optom 241  F  3C,3L  0.5
Physiological Optics
Ocular motility: Kinematics of eye movements, muscle actions, measurements of eye movements, types of eye movements, innervational systems subserving eye movements, clinical application.
Prereq: Optom 111

Optom 242  F  3C,3L  0.5
Clinical Optometry
Lectures and laboratories on clinical techniques for examination of the optical properties of the eye.
Prereq: Optom 111

Optom 244  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,1L  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
Optometrical Optics
A continuation of 116, dealing with problems peculiar to bifocal and multifocal lenses. Aberration of thin lenses and the design of lenses of ophthalmic use.
Prereq: Optom 116

Optom 251  W  3C,3L  0.5
Physiological Optics
Binocular vision and perception: The binocular system; binocular integration and interaction; effect of disparate stimulation; perceived size, shape, direction, distance, motion, colour, illusions.

Optom 252  W  3C,3L  0.5
Clinical Optometry
Lectures and laboratories on clinical techniques for examination of the optical properties of the eye.
Prereq: Optom 241/242

Optom 254  W  2C,2L  0.5
Physiology of the Visual Systems
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,1L  0.5
Ocular Pathology
A continuation of 246.
Prereq: Optom 245

Optom 259  W  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 261  F  3C,3L  0.5
**Physiological Optics**

Optom 274  W  2C  0.5
**Genetics for Optometrists**
(See Optom 514 for a detailed description)
Coreq: Optom 245, 255

Optom 401  F  3C,3L  0.5
**Physiological Optics**

Optom 402  F  3C,2L  0.5
**Clinical Optometry**
Case analysis of the nonstrabismic patient: case history, testing the health and integrity of the visual system, refractive tests, binocular relations, analysis, diagnosis, prognosis and modes of therapy.
Prereq: Optom 242, 252

Optom 404  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, accommodative response and eye movement.

Optom 405  F  3C,1L  0.5
**Ocular Pathology**
(See Optom 245 for detailed description)

Optom 406  F  2C,4L  0.5
**Optometrical Optics**
The lecture course deals with problems involved in selecting, preparing and fitting ophthalmic materials. Optical, cosmetic and comfort requirements, and patient counselling are considered. The laboratory course provides experience in preparing and fitting materials to patients.
Prereq: Optom 116, 246

Optom 407  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.
Prereq: Optom 401, 402

Optom 408  Y  8 Clinic  1.0
**Optometric Clinic**
The student is assigned to the various areas of the clinic and under the direct supervision of optometrists of the clinic staff, carries out routine clinical investigations of patients.

Optom 411  W  3C,3L  0.5
**Physiological Optics**
(See Optom 251 for detailed description)

Optom 412  W  3C,2L  0.5
**Clinical Optometry**
Detection and evaluation of sensory and motor characteristics of vision in strabismus. Classifications, diagnosis, prognosis, modes of therapy for strabismus and amblyopia.
Prereq: Optom 302, 312, 402

Optom 414  W  3C,2L  0.5
**Physiology of the Visual Systems**
The physiology of the smooth muscles of the eye, the extraocular striate muscles, lacrimal apparatus, cornea, iris, lens, ciliary body and vitreous body. Production and drainage of aqueous and related influences on intraocular pressure. The vascular supply of the eye.

Optom 415  W  3C,1L  0.5
**Ocular Pathology**
A continuation of 405.
Prereq: Optom 405

Optom 427  W  2C,2L  0.5
**Optometric Specialties: Aniseikonia and Low Vision Aids**
A series of lectures and laboratories in examining low vision and aniseikonic patients with specific techniques described. Treatment and therapy will be included.
Prereq: Optom 401, 402

Optom 428  W  1.0
**Spring Clinic**
Each student is required to complete 120 hours of clinical practice during the spring.
Prereq: Successful completion of Year 4 programme.
Cows

Optometrical Praxis
Practice management; financial management, establishing a practice, interprofessional relations, office design, optometric assistants, professional associations.

Optom 501 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 co-ordinator for details.

Optom 502 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.

Pediatric Optometry
Special aspects of the management of vision problems of infants and young children are discussed.

Visual Aspects of Learning Difficulties
The aspects of vision problems related to learning difficulty including tests and measurements taken by optometrists. The role of the optometrist in conjunction with the parents, teachers, and psychologists in assisting children to achieve is discussed.
Prereq: Optom 242, 252, 402, 412

Optom 504 F 4C,1L 0.5
Ocular Pharmacology
Neurohumoral theory, response to drugs, sterile techniques, disinfectants. Drugs used in contact lens practice, drugs used topically on the eye, drugs on the eye and vision.
Prereq: Optom 404, 405, 415

Optom 508 F 24 Clinic 0.5
Optometry Clinic
The clinical programme teaches the student how to provide optometrical services including pathology detection, strabismus evaluation and the application of spectacle therapy, contact lenses and vision training. The patients cared for extend from the pediatric to the geriatric, and include those with perceptual problems, or with low vision.
No credit given until successful completion of Optom 518.
Prereq: Permission of Clinic Director

Optom 509 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 510 W 2C 0.5
Optometrical Jurisprudence
Lectures relating to the legal aspects of practising optometry in Canada. The rights and responsibilities of the optometrist in practice are examined and discussed.

Optom 511 F 3L 0.5
Optometry Research Project
A continuation of 501. This course serves as an alternative to Optom 513.
Prereq: Optom 501

Optom 512 W 3C 0.5
Advanced Contact Lens Practice
A continuation of Optom 502 with an emphasis on research.

Visual Gerontology
Aspects of the aging process on the visual system and the optometrical management of the visual problems of older persons.

Recent Advances in Optometrical Technology and Instrumentation
The use and interpretation of new resources for collecting, recording, analyzing and using optometrical data.

Optom 513 W 2C 0.5
Optometric Communication
Verbal communication and counselling during the optometrical examination, alternatives to technical terminology, report and letter writing, preparing and delivering papers and talks to professional societies and public information.

Optom 514 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, etc. Genetic counselling, and the detection of carriers.
Prereq: Optom 405, 415

Optom 518 W 24 Clinic 0.5
Optometry Clinic
A continuation of 508
Prereq: Optom 508
Optom 519 W 4C 0.5
Aspects of prevention of accidents and injury to the visual system.
The production of efficient and comfortable vision at work and recreation.

Optom 538 F Clinic 0.0
Vision Care Projects
All students are required to participate in vision care projects between the fourth and fifth professional years. These will involve a minimum of 400 hours and will be arranged by the faculty.
Prereq: Successful completion of Optometry 408 and 428 and permission of the Chief of Clinics.

Optom 599 (A-E) W
Comprehensive examinations in Anatomy and Physiology, Pathology and Pharmacology, Physiological Optics, Optometrical Optics, Optometry. Graduation in Optometry is contingent upon successful completion of these comprehensive examinations involving oral, written and clinical applications of optometry. These examinations are ordinarily held in the final examination period of the Winter term, fourth professional year. These examinations have been approved for purposes of licensure for 1981 by the Council of the College of Optometrists of Ontario.

---

Peace and Conflict Studies

Associate Professor, Director of the Programme
C. G. Brunk, BA (Wheaton), MA, PhD (Northwestern)

Members of the Peace and Conflict Studies Faculty Group

Professors
L. Costa-Pinto, BA, PhD (Brazil)
F. H. Epp, (Bethel), MA, PhD (Minnesota)
W. Klaassen, BA, BD (McMaster), D.Phil (Oxford)
D. E. Smucker, BA (Bluffton), BD (Princeton), MA, PhD (Chicago)

Associate Professors
C. G. Brunk, BA (Wheaton), MA, PhD (Northwestern)
J. G. Holmes, BA, MA (Carleton), PhD (North Carolina)
M. F. McDonald, BA (Toronto), MA, PhD (Pittsburgh)
R. J. Sawatsky, BA (Bethel), MA (Minnesota), MA, PhD (Princeton)
J. O. Stubbs, BA (Toronto), MSc Econ (London), DPhil (Oxford)

Assistant Professors
R. Lahue, BSc (Fordham), PhD (Waterloo)
G. O. Michalenko, BA, PhD (Sask)
W. B. Moul, BA, MA, PhD (Br.Col.)

Core Courses

The Core Courses for each year of the programme are designed to bring together students from various disciplines who are interested in the problems of conflict and peace, with the objective of acquainting them with other disciplinary approaches to those problems. Core courses are taught in Conrad Grebel College by members of the PACS Faculty Group, other qualified and interested members of participating departments, or by eminent scholars in the field who will be invited to the University from time to time.

PACS 201 F 2C,1D 0.5
Peace and Conflict Studies 1
An examination of influential theories of the nature and roots of human conflict on both the interpersonal and inter-group level. Contributions of the behavioral and social sciences, as well as the humanities, will be explored.
Brunk
Peace and Conflict Studies 2
A continuation of PACS 201, with 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.

Brunk

PACS 301 F 3S 0.5
Peace and Conflict Studies 3
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.

Staff

PACS 302 W 3S 0.5
Peace and Conflict Studies 4
(Same as 301, above)

Staff

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 his own work.

Staff

PACS 499 W T 0.5
Senior Honours Seminar 2
Continuation of PACS 498.

Staff

Peace and Conflict Studies Content Courses Offered by Participating Departments

The following are courses approved as PACS-related which are offered by the participating departments under their own designations. Additions may occur following the suggestion of the departments concerned and approval by the PACS Faculty Group. Full course descriptions are found in the departmental sections elsewhere in this chapter.

Arts
These are PACS Content Courses of an interdisciplinary nature offered by Conrad Grebel College.

Arts 230G Nonviolence and Political Reality
Arts 271G Introduction to Peace Research 1
Arts 272G Introduction to Peace Research 2
Arts 398G Special Topics in Peace and Conflict
Arts 399G Special Topics in Peace and Conflict

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 216 Irish History in the Age of Unification and Revolt
Hist 245G Canadian Minorities 1
Hist 246G Canadian Minorities 2
Hist 247G Mennonite History 1
Hist 248G Mennonite History 2
Hist 348G Radical Reformation 2
Hist 351 A History of Blacks in Canada
Hist 374G The Middle East Conflict
Hist 385R History of Modern Revolutions 1
Hist 389R History of Modern Revolutions 2

Man-Environment Studies

M Env 241 Social Change
M Env 331 Environmental Issues in Global Perspective
M Env 338 Social Impact Assessment
M Env 375Z Politics of the Environment
M Env 400 Senior Honours Seminar in Environmental Management

Env S 401 Environmental Law

Philosophy

Phil 216 Rational Behaviour and Decision-Making
Phil 225 Social and Political Philosophy: Canadian Problems
Phil 243 Risk, Decision, Games, Amalgamation
Phil 325 Political Philosophy 1
Phil 326 Political Philosophy 2
Phil 327A Philosophy of Law 1
Phil 327B Philosophy of Law 2
Phil 328 The Philosophy of Karl Marx
Phil 329 War, Peace, and Justice

Political Science

P Sci 101 Introduction to Politics
P Sci 102A Imperialism and International Relations
P Sci 302K Mass Political Violence
P Sci 225 Political Theory 1
P Sci 226 Political Theory 2
P Sci 281 International Politics 1
P Sci 282 Foreign Policy
P Sci 321 Marxist Theory
P Sci 322 Marxism and Revolution after Marx
P Sci 350A The Politics of Developing Areas 1
P Sci 350B The Politics of Developing Areas 2
P Sci 380A World Politics 1
P Sci 380B World Politics 2
Personnel and Administrative Studies

Personnel and Administrative Studies (PAS) is a Minor Programme that can be taken in conjunction with an existing Honours Major. The Programme is designed to provide a broad interdisciplinary background that will prepare students for administrative or managerial roles in their future careers. At the same time, it permits students the opportunity to develop in depth the specialized academic interests of their major course of study. The PAS Minor may be combined with a co-operative programme in order to obtain work experience in this field.

The programme of study consists of twelve half-course credits that may be completed at any point in the four-year term. The courses reflect several central themes. First, analytical techniques are stressed. These “functional” tools of management 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 a more integrative perspective on the topic area. PAS 200 will be first offered in the Fall term, 1982.

Core Courses

A. Analytical Techniques
   1. Computer Science: One of CS112, 116, 180
   2. Statistics: MTHEL 102 or equivalent course within the student’s Honours Programme
   3. Accounting: Economics 281 or 191

B. Human Resources
   4, 5. Public Administration: Political Science 331, 332
   6, 7. Personnel and Industrial Psychology: Psychology 339, and Psychology 333 or Management Science 44
   8. Industrial Sociology: Sociology 242 or 342 or 340 or Management Science 52

C. Economic Factors
   9. Microeconomics: Economics 101
   10, 11. Economics and the Administrator: Economics 193, 194

D. PAS Basic Course
   12. Personnel Administration: PAS 200
   13. Issues in Personnel Administration: PAS 300
Department of Philosophy

Professor, Chairman of the Department
R. A. George, MA, PhD (Michigan State)

Associate Professor, Associate Chairman and Undergraduate Advisor
M. F. McDonald, BA (Toronto), MA, PhD (Pittsburgh)

Professors
E. J. Ashworth, BA, MA (Cambridge), PhD (Bryn Mawr)
L. L. Haworth, BA (Rollins), MA, PhD (Illinois)
J. S. Minas, BA (Wayne), PhD (Illinois)
J. F. Narveson, BA (Chicago), MA, PhD (Harvard)
B. H. Suits, BA, MA (Chicago), PhD (Illinois)
J. W. Tucker*, BS, BA, PhD (London)

Professor Emeritus
P. Seligman, BA, PhD (London)

Associate Professors
W. R. Abbott, BA (Kenyon), PhD (Ohio State)
C. G. Brunk, BA (Wheaton), MA, PhD (Northwestern)
G. T. Campbell, BA (W. Ont.), 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
B. P. Hendley, BA (Marquette), MA., PhD (Yale)
J. R. Horne, BA., MA (W. Ont), BTh (Huron),
PhD (Columbia)
A. Kerr-Lawson*, BA (Toronto), MA (Chicago),
PhD (McMaster)
A. C. Minas, BA (Radcliffe), MA., PhD (Harvard)
D. Roberts, BA (Roosevelt), MA., PhD (Illinois)
J. W. Van Evra, BA (Valparaiso),
MA., PhD (Michigan State)

Assistant Professors
C. R. Girodat, BA (W. Ont.), MA (Detroit),
PhD (Toronto) J
R. H. Holmes, BA., MA (Montana), PhD (Washington)
J. Wubnig, BA (Swarthmore), MA., PhD (Yale)

Faculty members holding joint appointments as shown
*Department of Pure Mathematics

Course Descriptions

Note 1
Any full course or two half courses in Philosophy can be used to satisfy the Group A(i) requirement.

Note 2
Courses 370 to 372, 380 to 389, 435 to 439, 440 to 444, 471 to 473, 480 to 489, are special courses offered in response to student demand or special interests of the faculty. Each Spring, the Department will publish a list of the courses offered under these numbers for the following academic year. This list will include descriptions of those courses whose content is not specified below and names of instructors for each course.

Note 3
Courses suffixed with “J” are administered by St. Jerome’s College; those suffixed with a “G” are administered by Conrad Grebel College.

Note Concerning Introductory Courses
It is Departmental policy to have small sections of each introductory course staffed by regular faculty. In addition there are weekly seminar-sized discussion groups in each course.

Phil 100 Y 2C,1D 1.0
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? Can we know whether there is a God? Is mind in any sense distinct from matter? Original texts of both classical and contemporary thinkers are employed.

Phil 111 F,W,S 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 people to philosophize. Approaches, such as those of the mystic, the scientist, the existentialist, the pleasure seeker, and the practical man, will be discussed.

Phil 120 W 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 125  F,W,S  2C,1D  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 135  F  3C  0.5
Introduction to the Philosophy of Religion
Beginning with a consideration of such contemporary religious and anti-religious options as secularism, mysticism, occultism, and charismatic renewal, this course moves to a critical discussion of such topics as religious experience, faith, God, and miracles.

Phil 140  F,W,S  3C  0.5
Introduction to Formal Logic
Elementary sentence and predicate logic. Translation from English into the formalism, decision methods and deductions. Application of Graphic Methods to Logic. This course is a preparation for courses in the foundations of mathematics, scientific methods, and more advanced logic courses.

Phil 145  F,W,S  3C  0.5
Critical Thinking
An analysis of basic types of reasoning, structure of arguments, critical assessment of information, common fallacies, problems of clarity and meaning.

Phil 150  W  2C,1D  0.5
Introduction: Knowledge and Reality
Discussion of the nature of reality. Rival theories concerning mind, matter, freedom, the existence of God, and the place of experience and reason in human knowledge are considered.

Phil 200 Y  2C,1D  1.0
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 200B W  2C,1D  0.5
Great Works of Western Philosophy: Part 11
Outstanding works from the early modern and contemporary periods.

Note
Either Phil 200A or Phil 200B may be taken separately.

Phil 201  F  2C,1D  0.5
Love
A philosophical analysis of different forms and functions of love. Among the topics to be considered: love and sexuality, religious love, love and knowledge. Classical and contemporary sources will be treated.

Phil 202  F  3C  0.5
Philosophy of Women
A study of some of the issues raised by the Women's Liberation movement. Philosophical writings of the past and present will be used on such subjects as: the two sexes, physiological femininity, personal and social relations between the sexes, the position of women in public life, marriage and its alternatives, the importance of childbearing.

Phil 203  F  3C  0.5
Philosophical Perspectives on Death
This course critically examines how philosophers from the Pre-Socratics to Wittgenstein have analysed the concept of death. The course is also concerned with topics like the concept of a person, personal identity, and survival after death.

Phil 210 W  2C,1D  0.5
Philosophy in Literature
Each term philosophical themes (such as alienation, freedom, and responsibility) will be explored through appropriate literary works (e.g. works by Camus, Dostoevsky, Kafka, and Sartre).

Phil 215  F  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 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 222  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: 221 recommended

Phil 224  W  3C  0.5
Mankind and Nature
An examination of some of the issues raised by recent discussions on ecology. Various theories of nature, the human being, and relations between the two will be explored. Possible foundations for duties of mankind toward nature will be examined.

Phil 225  W  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. Prereq: Philosophy 125 or consent of the instructor.

Phil 226  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 right to die, behavior control (e.g. psychosurgery, behavior modification and psychotherapy), human experimentation (including "informed consent" and fetal research) and genetic engineering. Prereq: One of Phil 125, 221, 222, or consent of instructor

Phil 235 Philosophy and Mysticism
Not offered in 1987-82

Phil 236  W  2C  0.5
Philosophy of Religion: The Occult
A critical philosophical discussion of reports of several kinds of extraordinary experiences, such as magic, extra-sensory perception, mysticism, and divination will lead us to discussions of such concepts as insanity, irrationality, the supernatural, and the miraculous.

Phil 240  Y  3C  1.0
Logic
A systematic development of the propositional calculus and of the first-order functional calculus. Some attention will be devoted to extensions and interpretations of such formal systems. Prereq: None for second-year students and above; consent of instructor for others.

Phil 241  W  3C  0.5
Intermediate Logic
Axiom systems of logics are developed and compared with natural deduction procedures. Then certain properties of these logical systems, such as consistency, completeness, and compactness, will be investigated. Prereq: Phil 140 or consent of the instructor.

Phil 242  F  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  W  3C  0.5  
Risk, Decision, Games, Amalgamation  
Fundamentals of probability and game theory. Problems of decision making under conditions of certainty, risk and uncertainty. The definition and measurement of utility functions. Translation of decisions and preferences of members of a group into collective preference. Some applications to the Social Sciences.  
Prereq: Phil 140, 145 or consent of instructor

Phil 258  W  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 explanation, the structure of scientific theories, the nature of law-likeness, the grounds for scientific confirmation, and the debate between rationalism and empiricism in science.

Phil 265  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. Offered in August at St. Jerome's College.

Phil 270/271 Special Topics in Philosophy  
Not offered 1981-82

Phil 280  F  3C  0.5  
History of Ancient Philosophy 1  
From the beginnings to Plato.  
Prereq: Second year standing or above, or consent of instructor

Phil 281  W  3C  0.5  
History of Ancient Philosophy 2  
From Aristotle to the close of classical antiquity.  
Prereq: Phil 280

Phil 282  F  3C  0.5  
History of Modern Philosophy 1  
Earlier period beginning with Descartes.  
Prereq: Second year standing or above, or consent of instructor

Phil 283  W  3C  0.5  
History of Modern Philosophy 2  
Later period including Hume and Kant.  
Prereq: Second year standing or above, or consent of instructor. Phil 282 recommended.

Phil 284  3C  0.5  
19th Century Philosophy  
The 19th century. Philosophers covered may include Hegel, Mill, Schopenhauer, James, and Kierkegaard.

Phil 285  3C  0.5  
20th Century Philosophy  
A course intended to introduce the student to the dominant themes of 20th century philosophy, centering on the major figures of this century, such as Bertrand Russell, Ludwig Wittgenstein, G. E. Moore, Edmund Husserl, and Jean-Paul Sartre.

Phil 300  W  3C  0.5  
The Philosophy of Games  
An introduction to philosophical issues relating to sports and other games. Among the issues examined will be the nature of games, games and sports, and the relevance of games and sports to other philosophical interests: e.g., ethics and aesthetics.

Phil 311  W  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  F  3C  0.5  
Philosophy of Education 2  
An introduction to current work in the field, particularly that of Peters, Hirst, and Dearden. Special attention will be paid to the question of the desirability of a core curriculum and its proposed content.  
Prereq: Phil 311 or consent of instructor

Phil 321/324  3C  0.5  
Studies in Ethics  
Various half courses dealing with special topics; one or more of these will be offered each year as announced by the Department.  
Prereq: Phil 221/222. See Note 1

Phil 325  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: Phil 125 or consent of the instructor

Phil 326  3C  0.5  
Political Philosophy 2  
A detailed discussion of contemporary theories.  
Prereq: Phil 125 or consent of the instructor
Phil 327A  F  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. Authors to be studied include Aquinas, Kant, Austin, and Hart.
Prereq: Phil 221 or another approved values course, or consent of the instructor.

Note
This is a required course for the Legal Studies Option.

Phil 327B  W  0.5
Philosophy of Law - Part 2
An examination of areas within the law in which philosophical problems and methods are featured prominently. Topics such as liberty, responsibility and liability, punishment, rights and possession are considered. 
Prereq: Phil 327A or consent of the instructor.

Phil 328 The Philosophy of Karl Marx
Not offered 1981-82

Phil 329  3C  0.5
War, Peace and Justice
An intensive study of the moral issues involved in war and armed revolution. Critical evaluation of “just war” theories, and international rules of warfare is pursued as well as the moral arguments for and against pacifism and conscientious objection.
Prereq: Phil 125, or 221/222, or consent of instructor.

Phil 331  3C  0.5
Aesthetics
Philosophical consideration of works of art and the problems of beauty using selected readings to enable the student to recognize and formulate his own views in a philosophic manner.
Prereq: One full or two half Philosophy courses, or consent of instructor.

Phil 335  3C  0.5
Philosophy of Religion
A critical examination of the methods and substantive arguments found in selected major works of religious philosophy. The writings chosen for consideration will be announced in advance each year.
Prereq: One full or two half Philosophy courses, or consent of instructor.
See Note 1.
Phil 363 Y 3C 1.0
Philosophy of Language and Linguistic Analysis
The first part examines issues in the philosophy of language, such as synonymy, propositions, meaning, semantics, reference. The second part will consider ordinary language analysis as a method for solving philosophical problems as compared with structural linguistics.
Prereq: At least second year standing or consent of instructor

Phil 363A F 3C 0.5
Philosophy of Language
The first part of Phil 363.

Phil 363B W 3C 0.5
Linguistic Analysis
The second part of Phil 363.

Note
Either Phil 363A or Phil 363B may be taken separately.

Phil 365-366 Y 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 370-372 3C 0.5
Special Subjects
One or more half courses will be offered at different times as announced by the Department.
Prereq: Consent of instructor. See Note 1

Phil 380-389 3C 0.5
Studies in the History of Philosophy
Various half courses dealing with a particular philosopher, a selected work or period; one or more of these will be offered each year as announced by the Department.
Prereq: Appropriate course(s) from Phil 280-285 or Phil 390-391, or consent of instructor.
See Note 1

Phil 390 F 3C 0.5
Medieval Philosophy 1
The early period of the 13th century. Among those considered will be: Augustine, Boethius, Anselm, and Abelard.
Prereq: one full or two half courses in Philosophy

Phil 391 W 3C 0.5
Medieval Philosophy 2
The later period from the 13th century. Among those considered will be: Bonaventure, Aquinas, Scotus, and Ockham.
Prereq: Phil 390

Phil 398a-b F,W,S R 0.5
Directed Reading in Special Areas
Prereq: Consent of instructor

Phil 399 T 1.0
Tutorial for Honours Students
Students wishing to enrol in 399 should consult the Department.

Phil 425 3C 0.5
Philosophy of the City
Analysis and evaluation of the philosophical points of view that underlie current criticism of urban life and prevalent schemes for its reconstruction.
Prereq: One half Philosophy course

Phil 435-439 3C 0.5
Students in Philosophy of Religion
A study of a particular philosopher or problem. The topic will be announced in advance each year.
Prereq: Consent of instructor. See Note 1

Phil 440-444 3C 0.5
Studies in Logic
Various half courses dealing with specific topics; one or more of these will be offered each year as announced by the Department.
Prereq: Phil 240, 241, 242 or 340 or PMath 430a.
See Note 1

Phil 446 3C 0.5
Philosophy of History
Consideration of various possible views about ultimate nature of history and historical knowledge.
Offered in sequence with Hist 466.
Prereq: One full course equivalent in Philosophy, or consent of instructor

Phil 455 Y 3C 1.0
Metaphysics
Studies of reality, metaphysical problems and issues. The first part ontology (nature of being) considers objects, their properties, and causation. The second part cosmology (principles of the universe) examines space, time, and motion.

Phil 455A F 3C 0.5
Ontology
The first part of Phil 455.
Phil 455B  W  3C  0.5  
**Cosmology**
The second part of Phil 455.

**Note**
Either Phil 455A or Phil 455B may be taken separately.

Phil 465  **Existential Philosophy**
*Not offered 1981-82.*

Phil 470  **Phenomenology**
*Not offered 1981-82.*

Phil 471-473  
**Problems**
One or more half courses will be offered at different times, as announced by the Department.

*Prereq: Consent of instructor. See Note 1*

Phil 480-489  
**Advanced Studies in the History of Philosophy**
Various half courses dealing with a particular philosopher, a selected work or period; one or more of these will be offered each year as announced by the Department.

*Prereq: Consent of instructor. See Note 1*

Phil 498(a-b)  F,W,S  R  0.5  
**Directed Reading in Special Areas**

*Prereq: Consent of instructor*

Phil 499  Y  T  1.0
**Tutorial and Honours Essay**
Students wishing to enrol in 499 should consult the Department.

*The following courses are administered by St. Jerome's College*

Phil 100J  Y  3C  1.0  
**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 120J  F  3C  0.5  
**Philosophy of Life and Death**
A study of what some of the great philosophers have said about the meaning of life and death and the transition from life to death. Students are urged to raise questions and help direct discussion.

*Offered in the evening.*

Phil 130J  W  3C  0.5
**Philosophy of Discontent**
A study of what some of the great philosophers have said about the causes of discontent. Social disobedience and the extent to which ethical principles can be altered to accommodate changing conditions are possible topics for discussion.

*Offered in the evening.*

Phil 200J  W  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 to argue with order, with facility and without error.

Phil 205J  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 206J  
**Philosophy of Science**
*Not offered in 1981-82.*

Phil 210J  J,W  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 218J  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.

*Also offered in the evening.*

Phil 219J  W  3C  0.5
**Practical Ethics**
This course will discuss the applications of general ethics to more specific areas of human endeavour. Among the topics discussed will be abortion, contraception, sex, obscenity, violence, drugs, egoism, dishonesty, and various forms of human exploitation.

*Also offered in the evening winter term.*
Phil 230J F 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.  
*Offered in the evening.*

Phil 237J A 3C 0.5  
**Ethics and Society**  
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.  
*Offered in the evening.*

Phil 260J J 3C 0.5  
**Issues in Higher Education**  
Why go to university? What are the present realities in Canada? What is the role of the liberal arts? The primary interest will be upon what can be done in practice rather than upon ideal schemes.  
*Offered in the evening.*

Phil 300J F 3C 0.5  
**The Western Philosophical Tradition (to 1600)**  
An intensive overview of the major recurring themes in Western intellectual history from both an historical and a philosophical viewpoint.  
*Prereq: Second year standing.*

Phil 301J W 3C 0.5  
**The Western Philosophical Tradition (1600-Present)**  
A continuation of 300J. Descartes to Existentialism.  
*Prereq: Second year standing.*

Phil 318J **Philosophy of the Family**  
*Not offered 1981-82.*

Phil 333J **Contemporary Philosophical Problems in Art**  
*Not offered in 1981-82.*

Phil 395J **The Thomistic Tradition in Philosophy**  
*Not offered 1981-82*

Phil 396J-397J 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 discussion.  
*Prereq: Consent of instructor*

Phil 399J Y 1.0  
**Tutorial**  
Students wishing to enroll in 399J should consult the College Department.
Department of Physics

Professor, Chairman of the Department
N. R. Isenor, BSc (Acadia), MSc, PhD (McMaster)

Associate Professor, Associate Chairman of the Department
J. K. Brandon, BSc, PhD (McMaster), MA (Cantab)

Professor, Associate Dean Graduate Affairs, Faculty of Science
R. A. Aziz, BA, MA, PhD (Toronto)

Professors
A. Anderson, MA, DPhil (Oxon)
G. A. Bakus, MA (Bratislava), MA, PhD (Toronto)
F. W. Boswell, BA, MA, PhD (Toronto)
D. E. Brodie, BSc, MSc, PhD (McMaster)
J. A. Cowan, BSc (Manitoba), MA, PhD (Toronto)
I. R. Dagg, BSc (Manitoba), MS (Penn State), PhD (Toronto)
M. P. FitzGerald, BSc, MSc, PhD (Case)
J. Grindlay, BSc (Glasgow), DPhil (Oxon)
J. Kruuv*, BASc (Waterloo), PhD (W. Ont.)
J. W. Leech, BS, PhD (London), FInstP
J. D. Leslie, BASc (Toronto), MS, PhD (Illinois)
A. D. S. Nagi, BA, BSc, MSc (Panjab), PhD (Delhi)
J. L. Ord, BASc (Toronto), MS, PhD (Illinois)
R. K. Pathria, BSc, MSc (Panjab), PhD (Delhi)

Recipient of the Distinguished Teacher Award
W. B. Pearson*, DFC, MA, DSc (Oxon), FRSC, FCIC
M. M. Pintar*, BSc, MSc, PhD (Ljubljana)
G. Scoles*, BSc, PhD (Genova)
R. A. Snyder, BSc, PhD (W. Ont.)
D. M. R. Taplin*, BSc (Aston), DPhil (Oxford), DSc, PEng, CEng, FIM
S. F. Wang, DSc (Nagoya)

Associate Professors
J. M. Corbett, BASc (Toronto), MSc, PhD (Waterloo)
A. E. Dixon, BSc (Mt. Allison), MSc (Dalhousie), PhD (McMaster)
P. C. Eastman, BSc, MSc (McMaster), PhD (Br. Col.)
H. K. Ellenton, BSc (W. Ont.), MA (Toronto)
D. Hemming, BSc, PhD (Bristol)
C. C. Lim, BA (DePauw), MA (Nebraska), PhD (Toronto)
R. S. Moore, BSc, MSc (McMaster), PhD (Alberta)
H. M. Morrison, BSc, PhD (Edinburgh)
H. J. T. Smith, BSc, PhD (London)
B. H. Torrie, BASc (Toronto), PhD (McMaster)
J. Vanderkooy, BEng, PhD (McMaster)
K. A. Woolner, BSc (London)

Assistant Professors
J. R. Lepock*, BS, MS (W. Virginia), PhD (Penn State)
D. R. Rayburn, BSc (Calgary), PhD (Queen’s)

Visiting Assistant Professor
K. Karmeshu, BSc, MSc, PhD (Delhi)

Senior Demonstrators
A. B. Haner, BSc, MSc (Waterloo)
D. S. McVicar, BSc (Waterloo)

Research Assistant Professor
G. L. H. Harris, BA (Mount Holyoke), MA (Wesleyan), PhD (Toronto) (part-time)
J. Mizia, MS, PhD, Dhab (A. Mickiewicz Univ., Poznan)

Adjunct Faculty
W. E. Harris*, BSc (Alberta), MSc, PhD (Toronto)
M. L. Klein*, BSc, PhD (Bristol)
D. W. Kydon*, BA (J. Hopkins), MSc., PhD (McMaster)
J. Lil*, BSc, DipEd (Hong Kong), DSc (Laval)
L. A. A. Read*, BA, MSc (McMaster), PhD (Waterloo)
M. C. Richardson*, BSc, ARCS (Imp. Coll.), PhD (London)
R. C. Shukla*, BSc, MSc, PhD (Allahabad)
P. G. Sutherland*, BSc (McGill), MS, PhD (Illinois)

Faculty members holding cross or adjunct appointments as shown
1Department of Biology
2Department of Chemistry
3Department of Applied Math
4Department of Mechanical Engineering
5National Research Council
6Wilfrid Laurier University
7McMaster University
8University of Winnipeg
9Brock University

Course Descriptions

Physics

Note 1
Details of the undergraduate programmes offered by the Faculty of Science are to be found in Chapter 14.

Note 2
Prerequisites are given as a guide to the student and may be waived with the consent of the instructor.

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.
Phys 010 F,W,S 1C 0
Physics Seminar
This seminar brings together Honours Physics (including Co-op students) in Years 2, 3 and 4, to receive information concerning the activities of the Physics Department and to hear invited speakers.

Phys 011 F 4C,2T 0.5
Mechanics

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. A course for Kinesiology students. Lab alternate weeks, optional tut.

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. A course for Kinesiology students. Prereq: Phys 103 or 104. Lab alternate weeks, optional tut.

Phys 111 F 3C,1T 0.5
Physics For the Life Sciences 1
An introduction to physics for students intending to concentrate their further studies in biology, medicine or dentistry; includes particle kinematics and dynamics, energy and momentum conservation, gravitation, 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.

Phys 112L W 3L 0.25
Physics For The Life Sciences 2 Laboratory
For students taking Phys 112. Lab alternate weeks.

Phys 121 F 3C, 1T 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 Math-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,S 3C,1T 0.5
Introductory Physics 2
This course is a continuation of Phys 121; includes fluid statics and dynamics, oscillating systems, gravitation, electrical currents and resistive circuits, capacitative and inductive circuits, alternating currents and resonant circuits. Prereq: Phys 121. Science students must take 122L with this course.

Phys 122L W,S 3L 0.25
Introductory Physics 2 Laboratory
For students taking Phys 122. Lab alternate weeks.

Phys 162 F 3C,1T 0.5
Enriched Introductory Physics 1
This is an enriched version of Phys 121; includes the topics listed in the description of Phys 121 plus enrichment topics, e.g. Taylor series, numerical methods for solving differential equations and programming the Physics Nova computer. Prereq: At least 85% average in Ontario Grade 13 Physics, Math-Functions and Relations, and Calculus. Enrolment may be limited. Science students must take 162L with this course.

Phys 162L F 3L 0.25
Enriched Introductory Physics 1 Laboratory
For students taking Phys 162. Lab alternate weeks.
Phys 163  W,S  3C,1T  0.5
Enriched Introductory Physics 2
This course is a continuation of Phys 162; includes topics listed in the description of Phys 122 plus enrichment topics, e.g. Fourier series, complex exponentials.
Prereq: Phys 162. Science students must take 163L with this course.

Phys 163L  W  3L  0.25
Enriched Introductory Physics 2 Laboratory
For students taking Phys 163.
Lab alternate weeks.

Phys 222  F  3C  0.5
Electricity and Magnetism 1
Coulomb’s law, electric field, Gauss’ law, potential, capacitance, properties of dielectrics, current, resistance, electromotive force, D.C. circuits and instruments.
Prereq: First year physics and calculus. Not for Hons. Physics students. Physics Majors must take 222L with this course.

Phys 222L  F  3L  0.25
Electricity and Magnetism 1 Laboratory
For students taking Phys 222.
Lab alternate weeks.

Phys 223  W  3C  0.5
Electricity and Magnetism 2
Magnetic fields, induced electromotive forces, magnetic properties of matter, alternating currents, electromagnetic waves.

Phys 223L  W  3L  0.25
Electricity and Magnetism 2 Laboratory
For students taking Phys 223.
Lab alternate weeks.

Phys 226  F  2C  0.5
Optics 1
Reflection and refraction at plane and curved surfaces, thin and thick lenses, optical instruments.
Prereq: First year physics and calculus. Not for Hons. Physics students. Physics Majors must take 226L with this course.

Phys 226L  F  3L  0.25
Optics 1 Laboratory
For students taking Phys 226.
Lab alternate weeks.

Phys 227  W  2C  0.5
Optics 2
The wave nature of light, interference, diffraction, slits and gratings, resolution, polarization, photometry, colour.

Phys 227L  W  3L  0.25
Optics 2 Laboratory
For students taking Phys 227.
Lab alternate weeks.

Phys 243  F,W,S  3C  0.5
Electricity and Magnetism
Electric & magnetic fields, capacitance & dielectrics, electromagnetic induction, instruments, Magnetic properties of matter.
Prereq: First year physics and calculus. This course is primarily intended for Hons. Chem students.

Phys 243L  F,W,S  3L  0.25
Electricity and Magnetism Laboratory
For students taking Phys 243.
Lab alternate weeks.

Phys 246  W  3C,1T  0.5
Physical Optics
Prereq: First year phys and calculus. Coreq: Phys 246L. This course is primarily intended for students interested in the Optometry programme.

Phys 246L  W  3L  0.25
Physical Optics Laboratory
For students taking Phys 246.
Lab alternate weeks.

Phys 250  F  3C  0.5
The Solar System
An introduction to the astronomy and astrophysics of the solar system for students with a background in (elementary) University Physics and Mathematics.
Prereq: First year Phys and Math.

Phys 251  W,S  3C  0.5
The Stellar System
An introduction to the astronomy and astrophysics of objects beyond the solar system for students with a background in (elementary) University Physics and Mathematics.
Prereq: First year Phys and Math.
Phys 253 W,S 3C 0.5

Electricity and Magnetism
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.

Prereq: First year physics and calculus, Math 216. Physics majors must take 253L with this course. Recommended for students in Honours programmes. This course forms a basis for the understanding of most of today's electronic and electrical technology.

Phys 253L W,S 3L 0.25
Electricity and Magnetism Laboratory
For students taking Phys 253.
Lab alternate weeks.

Phys 254 F 3C 0.5

Thermal Physics and Properties of Matter
An introductory course in thermal physics, kinetic theory and properties of matter; includes thermodynamics, heat engines, kinetic theory of gases, viscosity, diffusion, transport properties of elasticity.

Prereq: First year physics and calculus. Recommended for students in Honours programmes.

Phys 255 W,S 3C 0.5

Quantum Physics
Background to quantum physics: special relativity, Bohr atom, wave-particle properties, uncertainty and wave packets. Introduction to quantum mechanics: equation for travelling wave, Schrödinger equation, solutions with potentials, correspondence principle, brief description of transitions and radiation processes.

Prereq: First year physics and calculus. Recommended for students in Honours programmes.

Phys 256 F 3C 0.5

Wave Motion and Optics
Matrix treatment of ray tracing and wave propagation, cardinal points of optical systems, reflection and transmission coefficients. Coupled oscillators and normal modes, continuous systems and standing waves, superposition and Fourier analysis, dispersion. Travelling waves and the wave equation. Interference and diffraction.

Prereq: First year physics and calculus. Physics majors must take 256L with this course. Recommended for students in Honours programmes.

Phys 256L F 3L 0.25
Optics Laboratory
For students taking Phys 256. Lab alternate weeks.

Phys 259 W,S 3C 0.5

Crystallography and X-Ray Diffraction
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

Phys 259L W,S 3L 0.25
Crystallography and X-Ray Diffraction Laboratory
For students taking Phys 259. Lab alternate weeks.

Phys 270 F 3L 0.25

Laboratory
Further experiments in optics and properties of matter, for students taking Phys 256L.
Lab alternate weeks.

Phys 271 W,S 3L 0.25

Laboratory
Further experiments in electricity, magnetism and properties of matter, for students taking Phys 253L.

Phys 301 F 3C 0.5

Physical Techniques for Biologists 1
Visible, UV, dark field, phase, interference, polarizing and fluorescence microscopy; electron microscopy; visible and UV spectroscopy; polarography; pH and ion electrodes; osmometers; densitometers; radioactive tracers and counters; introductory electronics; data analysis.

Prereq: First year physics. Physics students may not take this course for credit.

Phys 302 W 3C 0.5

Physical Techniques for Biologists 2
Infrared, Roman and fluorescence spectroscopy; nuclear magnetic and electron paramagnetic resonance spectroscopy; optical rotary dispersion and circular dichroism; X-ray diffraction; chromatography and electrophoresis; differential scanning calorimetry; ultra centrifugation; flame photometry; X-ray and atomic absorption spectroscopy; cell counting, cytfluorometry and cell viability.

Prereq: First year physics. Physics students may not take this course for credit.
Course Descriptions
Physics

Phys 324 F 3C 0.5
Atomic and Nuclear Physics 1
Fundamentals of modern physics, special theory of relativity, quantization of electromagnetic radiation, wave properties of particles, the hydrogen atom.
Recommended for students in General programmes.

Phys 325 W 3C 0.5
Atomic and Nuclear Physics 2
Many electron atoms, atomic and X-ray spectra, nuclear structure, nuclear reactions, molecular and solid state physics.
Prereq: Phys 324.
Recommended for students in General programmes.

Phys 350 F 3C 0.5
Astrophysics 1
Prereq: None, however familiarity with the contents of Phys 250-251 will be assumed. For third and fourth year students.

Phys 351 W,S 3C 0.5
Astrophysics 2
Prereq: None, however, familiarity with the contents of Phys 250-251 will be assumed. For third and fourth year students.

Note
Phys 449, Phys 451, are also open to third and fourth year students: Phys 350 alternates with Phys 451 and Phys 351 alternates with Phys 449.

Phys 352 F,S 3C 0.5
Electronics 1
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 F,S 3L 0.25
Electronics 1 Laboratory
For students taking Phys 352. Lab alternate weeks.

Phys 353 W 3C 0.5
Electronics 2
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 352 or equivalent. Coreq: 353L

Phys 353L W 3L 0.25
Electronics 2 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-dimension potentials, hydrogen atoms, angular momentum and spin, molecular vibrations and rotations, many electron atoms, radiation processes.
Prereq: Phys 255.

Phys 355 W 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 255.

Phys 356 F,S 3C 0.5
Thermodynamics
Thermodynamic systems, equation of state, the laws of thermodynamics with applications. Change of phase.
Prereq: Math 213a-213b and a first year physics course.

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. 18 hours of experiments

Phys 360B W 3L 0.25
Intermediate Laboratory
Continuation of 360A. 18 hours of experiments
**Physics**

**Phys 362** F,S 3C 0.5

**Classical Mechanics 1**

Formal structure of classical mechanics with simple applications: foundations of Newtonian mechanics, dynamics of particles and systems of particles, linear oscillations, variational methods, Hamilton’s Principle, Lagrangian and Hamiltonian dynamics.

*Prereq:* First year physics, Math 113, 213a-213b and 216. This course is primarily intended for Hons. Physics students.

**Phys 363** W 3C 0.5

**Classical Mechanics 2**

Application of the methods of classical mechanics to central force motion, nonlinear oscillations, two-particle collisions, motion in noninertial frames, rigid body rotation, coupled oscillations.

*Prereq:* Phys 362. This course is primarily intended for Hons. 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, fluids, electromagnetism and relativity.

*Prereq:* Math 213a-213b and 216. This course is primarily intended for Hons. Physics students.

**Phys 365** W 3C 0.5

**Mathematical Physics 2**


*Prereq:* Math 213a-213b and 216. This course is primarily intended for Hons. Physics students.

**Phys 368** F 2C 0.5

**Geophysics 1**


*Prereq:* First year physics and calculus.

**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. (Identical to Earth 369).

*Prereq:* First year physics and calculus

**Phys 371A** F,S 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 380** F 3C 0.5

**Molecular Biophysics**

Macromolecular structure and function, weak interactions, DNA replication, protein synthesis, energy production, photosynthesis, control of intracellular processes, structure of viruses, physical techniques.

**Phys 381** W 3C 0.5

**Cell Biophysics**

Structure and function of cellular membranes and organelles, membrane potentials and ion transport, nerve conduction, muscle contraction, vision and interaction of light with cells intercellular communication, growth control.

**Phys 432** W 3C 0.5

**Physics of Solid State Devices**

The theories of solid state physics are applied to explain the operation and use of several modern electronic devices, including the p-n junction, transistors, thyristors, tunnel diodes, field effect devices, optical devices, etc.

*Prereq:* Phys 435

**Phys 433** Y 6L 1.0

**Experimental Research Project**

An experimental research project. This course is designed for students in the Honours Physics programme and in the Co-operative Applied Physics programme.

*Students in the regular Hons Physics programme must take either Phys 433 or Phys 437. Although students in the Co-operative Applied Physics (Hons) programme are recommended to take one of these courses, enrolment may be limited.

**Phys 434A** F 3C 0.5

**Introductory Quantum Mechanics**


*Prereq:* Phys 354
Course Descriptions

Physics

Phys 434B  W  3C  0.5
Quantum Mechanics
Prereq: Phys 434A

Note
Phys 434B is strongly recommended for students intending to do graduate work.

Phys 435  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: Phys 255

Phys 437A  F,W  3R  0.5
Theoretical Physics Project
Selected subjects for advanced study by theoretically inclined students, topics in relativistic, quantum, and statistical physics. Fall term enrolment will be limited. Students in the regular Hons Physics programme must take either Phys 437A or Phys 433. Although students in the Co-operative Applied Physics (Hons) programme are encouraged to take one of these courses, enrolment may be limited.

Phys 437B  W  3R  0.5
Continued Theoretical Physics Project
A continuation and extension of the project initiated in Phys 437A. Available only to those students who have satisfactorily completed that portion of the project contained in Phys 437A in the immediately preceding term.

Note
Students intending to take both Phys 437A and 437B must register for both courses, and have their registration approved by the Theoretical Physics Project co-ordinator, at the start of the Fall term.

Phys 441  Y  3C  1.0
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 plane waves, theory of waveguides and introduction to radiation.
Prereq: Phys 222-223 or Phys 253, Phys 364-365.

Phys 442  W  3C  0.5
Structure of Solids
A survey with emphasis on the physical properties and behaviour of metals and alloys. Elastic and plastic deformations of crystals. Solidification, structure of alloys, free energy of alloy systems, equilibrium diagrams, diffusion, solid state phase transformations.
Prereq: Phys 435

Phys 443  W  3C  0.5
Continuum Mechanics
Prereq: Phys 364-365

Phys 444  W  3C  0.5
Nuclear and Particle Physics
Prereq: Phys 355, and Phys 434A

Phys 445  F  3C  0.5
Modern Optics
Prereq: Phys 256 and Phys 354.

Phys 449  W,S  3C  0.5
Radio Astronomy
Radio telescopes. Radio sources including the sun. H II regions, H I regions. The galactic centre, pulsars, quasars, other extragalactic sources, cosmological implications.
Prereq: Phys 223 and Phys 250-251

Phys 450  F  3C  0.5
Astrophysics 3
Solar system astrophysics (excluding the sun). The physical nature of planetary (and satellite) surfaces, atmospheres and interiors. Asteroids, meteorites and comets. The interplanetary medium (solar wind). Solar interactions with the interplanetary medium and earth's magnetosphere.
Prereq: none, however, familiarity with the contents of Phys 250-251 will be assumed.
Phys 451 F 3C 0.5

Astrophysics

The structure of stellar interiors, nuclear reactions and energy sources in the stars of the main sequence, early evolution of stars from the main sequence. Lifetimes of the stars.

Prereq: None, however, familiarity with the contents of Phys 250-251 will be assumed.

Note

Phys 350, Phys 351 are also open to third and fourth year students. Phys 350 and Phys 351 are offered in alternate years to Phys 449 and Phys 451.

Phys 453 W 3C 0.5

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 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


Prereq: Phys 464

Phys 480 F 3C 0.5

Radiation Biophysics

The effect of radiation of various kinds on cells and tissues, exposure calculations, mechanism of damage, repair theories, genetic effect, target theory, isotopic tracers in biophysical research.

Phys 481 W 3C 0.5

Biophysics of Organ Systems

Physics of homeostasis, interactions with the environment, circulation of blood, temperature regulation, respiration, transport problems and special organ systems.

Phys 482 W 3C 0.5

Biophysics of Nervous Systems

Neurons: nerve conduction, sensory transducers; coding, processing and storage of information; control of muscles and other effector organs.

Recommended for third or fourth year students in Math, Eng, Sci or HKLS.
P Sci 102A Imperialism in International Relations
Not offered 1981-82.

P Sci 102C W 0.5
Politics in Action
An examination of the way in which society’s conflicting demands are organized, articulated, and translated in action. The part played by the various political and economic forces in society will be examined in a comparative framework.

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 three 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 relationship to political obligations (duties).

P Sci 102F W 0.5
Populism
The course examines movements, parties and regimes which have been commonly referred to as “populist”. Students will study the social bases, ideas, appeal, and policies of populist movements in North America, Latin America, Europe, Russia and Africa.

P Sci 102H W 0.5
Citizen Participation in Canada
An investigation of the relationship between political participation and democracy - exploring the question of how much participation is good and the ways in which it can be exercised-leading to an in-depth examination of the distribution of power in Canada.

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,1L 0.5
Quantitative Analysis
An introduction to the use of quantitative methods in Political Science. Only a rudimentary understanding of mathematics is required. 
Prereq: Second year standing

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 seventeenth century.
Prereq: Second year standing

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 seventeenth century.
Prereq: Second year standing

P Sci 253 F 2C 0.5
Comparative Communism 1
An examination of the historical development of the communist international system, the cause of its diversity and doctrinal variety, with emphasis on common problems and the role of ruling parties, their objectives, performance, and strategy.
Prereq: Second year standing

P Sci 254 Comparative Communism 2
Not offered 1981-82.

P Sci 260 Y 2C,1D 1.0
Canadian Government and Politics
An analysis of the structure and practices of the Canadian political system.
Prereq: Second year standing

P Sci 260A F,S 2C,1D 0.5
Canadian Government and Politics 1
The first half of P Sci 260, for students in co-operative programmes only.
No prereq for students in the second year and above

P Sci 260B W 2C,1D 0.5
Canadian Government and Politics 2
The second half of P Sci 260, for students in co-operative programmes only.
Prereq: P Sci 260A or consent of instructor

P Sci 264 F,W 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
### Course Descriptions

**Political Science**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Type</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>P Sci 268</td>
<td>2C,1T</td>
<td>0.5</td>
</tr>
<tr>
<td><strong>British Government and Politics</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>An examination of the uniquely British characteristics of the British political system.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>No prereq for students in the second year or above</em></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Type</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>P Sci 271</td>
<td>F</td>
<td>2C,1L</td>
</tr>
<tr>
<td><strong>Political Behaviour 1</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Empirical approaches to the study of politics are examined in light of their assumptions, aspirations, and critics.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>No prereq for students in the second year and above</em></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Type</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>P Sci 272</td>
<td>W</td>
<td>2C,1L</td>
</tr>
<tr>
<td><strong>Political Behaviour 2</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>An examination of the political attitudes and behaviour of men and women in different political systems.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prereq: P Sci 271 or consent of instructor</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Type</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>P Sci 281</td>
<td>F</td>
<td>2C</td>
</tr>
<tr>
<td><strong>International Politics</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>This course studies the transformation of the international system stressing East-West, Rich-Poor, and North-South perspectives and interactions.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>No prereq for students in the second year and above</em></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Type</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>P Sci 282</td>
<td>W</td>
<td>2C</td>
</tr>
<tr>
<td><strong>Foreign Policy</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>This course studies the roots of foreign policy behaviour of selected western and non-western (particularly Asian) states.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prereq: P Sci 281 or consent of instructor</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Type</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>P Sci 281</td>
<td>F,S</td>
<td>3C</td>
</tr>
<tr>
<td><strong>The Canadian Legal Process</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>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.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prereq: Open to all students in the second year and above</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Type</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>P Sci 292</td>
<td>W</td>
<td>3C</td>
</tr>
<tr>
<td><strong>Issues in Canadian Criminal Law</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rational principles and concepts applicable to current emotional criminal issues are analysed 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.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prereq: Open to all students in the second year and above</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Type</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>P Sci 293</td>
<td>F</td>
<td>L/S3</td>
</tr>
<tr>
<td><strong>Political Journalism</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>An account of the special factors affecting political reporting and commentary in the broadcast and print media, with a critical evaluation of contemporary practice in the field. Taught by a practising journalist.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>No prereq for students in the second year and above</em></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Type</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>P Sci 311</td>
<td></td>
<td>0.5</td>
</tr>
<tr>
<td><strong>Methodology of Political Science: The Foundations</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A selective examination of seminal works which have contributed to our understanding of the methods appropriate to the study of politics. Not a survey course.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prereq: Consent of the instructor</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Type</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>P Sci 312</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Approaches to Survey Analysis in Political Science</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not offered 1981-82.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Type</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>P Sci 315</td>
<td></td>
<td>0.5</td>
</tr>
<tr>
<td><strong>Research Design in Political Science</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>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.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prereq: P Sci 214 or consent of instructor</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Type</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>P Sci 321</td>
<td>F</td>
<td>2S</td>
</tr>
<tr>
<td><strong>Marxist Theory</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>An examination of the formation of Marx's method and of its significance for the proletariat.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>No prereq for students in the third year and above</em></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Type</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>P Sci 322</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Marxism and Revolution After Marx</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not offered 1981-82.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Type</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>P Sci 323</td>
<td></td>
<td>0.5</td>
</tr>
<tr>
<td><strong>Ancient Political Philosophy</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A selective examination of political philosophy during the classical period in Greece.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prereq: Consent of the instructor</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Type</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>P Sci 324</td>
<td></td>
<td>0.5</td>
</tr>
<tr>
<td><strong>Modern Political Philosophy</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A selective examination of political philosophy in the modern period.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prereq: Consent of instructor</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
P Sci 325 Radical Political Theory
Not offered 1981-82.

P Sci 327 Political Science and Political Values
Not offered 1981-82.

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 260 or consent of instructor

P Sci 332 W,S 2S 0.5
Public Administration 2
Analyses 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 0.5
Administrative Law
A study of Canadian administrative law including the delegation of political power to various administrative agencies which play a prominent role in controlling contemporary social and economic life. The supervisory role of the courts will also be examined.
Prereq: P Sci 331 or consent of instructor.

P Sci 341 F 2C,1S,1L 0.5
Provincial Politics
A comparative analysis of the political systems of the Canadian provinces which explores the possibility that as many as ten political cultures exist in Canada.
Prereq: P Sci 260

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 260 or 341 or consent of instructor

P Sci 343 F 2C 0.5
Canadian Municipal Government
A study of the assumptions, structures, and performance of municipal government in Canada with reference to metropolitan and regional structural innovations (particularly in Ontario).
Open to students in the third year and above with at least one previous course in Political Science

P Sci 344 W 2C,1T 0.5
The Politics of Local Government
A study of the political process 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

P Sci 350 Y 3C 1.0
The Politics of the Developing Areas
An examination of selected topics in the politics of developing areas, with emphasis on the theoretical and empirical adequacy of explanations of macro and micro political and economic change in Asia, Africa and Latin America.
No prereq for students in the third year or above

P Sci 350A F 8C 0.5
The Politics of the Developing Areas 1
The first half of P Sci 350.
No prereq for students in the third year or above

P Sci 350B W 3C 0.5
The Politics of the Developing Areas 2
The second half of P Sci 350. May be taken separately.
No prereq for students in the third year or above

P Sci 351 S 2S 0.5
Comparative Federal Systems
A comparative examination of federal systems, with an emphasis on the problems and processes of integration and disintegration.
Prereq: Consent of the instructor

P Sci 352 F 3S 0.5
Comparative Legislative Systems
A comparison of the institutional and behavioural characteristics of legislatures in a comparative framework, with emphasis on Canada, the United States, Great Britain, and Australia.
Prereq: Consent of the instructor

P Sci 362 F 2S 0.5
Soviet Government and Politics
An intensive survey of the development of Soviet political structures with analysis of the relative influence of ideological goals on the one hand and social forces on the other.
Prereq: P Sci 253-254 or consent of instructor.
P Sci 363  F  0.5  
**Canadian Constitutional Law**
An introduction to the nature and basic principles of constitutional law. This course will deal especially with the distribution of powers in the Canadian federation, and its evolution, notably by judicial decision. Leading cases will be examined.  
*Prereq: Political Science 260 or 260A or consent of instructor.*

P Sci 364  0.5  
**Politics in Italy**
An examination of the social, economic, and ideological forces underlying contemporary politics in Italy.  
*Prereq: Consent of the instructor.*

P Sci 371 **Political Culture**  
*Not offered 1981-82.*

P Sci 373  0.5  
**Political Parties**
An examination of the relationship of political parties and party systems to the dynamics of social change taking into account the imperatives of survival and adaption and the dilemma of principles versus power.  
*Prereq: At least one of P Sci 260, 262, 264, 268, 271, or 272.*

P Sci 374  F  2S  0.5  
**Interest Group Politics**
A study of interest group theory and comparative analysis of the internal politics of interest groups and their role in the political process.  
*Prereq: At least one of P Sci 260, 262, 264, 268, 271, or 272.*

P Sci 380  Y  1.0  
**World Politics**
An examination of the structure or institutional arrangements of global society and their interrelationships with interstate war and the allocation of misery. A wide range of theories of international violence and imperialism will be considered.  
*Open only to students in the third year and above.*

P Sci 380A  F  0.5  
**World Politics 1**
The first half of P Sci 380.  
*Open only to students in the third year and above.*

P Sci 380B  W  0.5  
**World Politics 2**
The second half of P Sci 380.  
*Open only to students in the third year and above.*
Course Descriptions
Political Science

P Sci 436  W,S  2S  0.5
Comparative Public Policy
A comparative examination of public policy and approaches to the study of public policy, with case studies from Germany, Britain, France, Sweden, Canada, the United States and India.
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 260 or 341 or consent of the instructor.

P Sci 443  Politics in Western Canada
Not offered 1981-82.

P Sci 445  Politics in the Atlantic Provinces
Not offered 1981-82.

P Sci 453  F  3S  0.5
Comparative Politics I
Selected Topics in Comparative Politics
Prereq: Consent of the instructor.

P Sci 454  W  3S  0.5
Comparative Politics II
Selected Topics in Comparative Politics.
Prereq: P Sci 453.

P Sci 461  F  2C,1S  0.5
Problems in Canadian Politics I
A critical examination of various problems of Canadian politics, with an emphasis on political integration, federalism and political parties.
Prereq: Consent of the instructor.

P Sci 462  W  0.5
Problems in Canadian Politics II
A senior research course on selected aspects of Canadian political life, with emphasis on the preparation of a major and original research paper.
For fourth year Political Science students but open to others with prereq P Sci 461.

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 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 479  2S  0.5
Senior Research Seminar: Violence in the Political Process
Politics can be brutal. This seminar deals with violence in the political process. The focus is on the relationships between the society and the coercive apparatus of the state.
Prereq: Third or Fourth Year standing.

P Sci 481  F  2S  0.5
Research Seminar on World Politics
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 the 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 powers. Strategic concepts are studied with specific reference to military policies of regional powers.
Prereq: Fourth year standing or consent of instructor.
**Political Science**

**Course Descriptions**

**Psychology**

**P Sci 486**  
**F 3S 0.5**  
**Middle Powers and World Politics**  
The course studies the literature on middle powers (including Canada). Particular emphasis is on the study of self-images, views of power, of power politics, and the sources of influence of these powers.  
Prereq: Fourth year standing or consent of the instructor.

**P Sci 490-498**  
**Special Subjects**  
0.5 each

From time to time courses of special study may be added to the programme at the fourth year level. Students wishing to add such courses should consult the Department's Undergraduate Officer.

**P Sci 499 Y**  
**1.0**  
**Senior Honours Essay**  
Students wishing to undertake a senior honours essay in their fourth year should consult the Department's Undergraduate Officer.

---

**Department of Psychology**

**Professor, Chairman of the Department**  
T. G. Waller, BS, MS (Southern Mississippi), PhD (Vanderbilt)

**Professor, Associate Chairman Graduate Affairs**  
J. A. Cheyne, BA (Waterloo Lutheran), MA, PhD (Waterloo)

**Associate Professor, Associate Chairman Undergraduate Affairs**  
G. E. MacKinnon, BA (Queen's), PhD (Johns Hopkins)

**Professor, Dean, Faculty of Arts**  
R. K. Banks, BA, MA, PhD (Toronto)

**Associate Professor, Associate Dean (Undergraduate Affairs), Faculty of Arts**  
G. A. Griffin, BA (Colgate), MA, PhD (Wisconsin), Recipient of the Distinguished Teacher Award

**Professors**

K. S. Bowers, BA, PhD (Illinois)  
M. Bradenbaugh, BA (Wittenberg), PhD (Vienna)  
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. Knapper5, BA (Sheffield), PhD (Sask.)  
H. M. Lefcourt, BA (Antioch), MA, PhD (Ohio State)  
M. J. Lerner1, BA, MA (Ohio State), PhD (New York)  
R. G. Marteniuk5, BPE, MA (Alberta), EdD (California)  
D. Meichenbaum, AB (City College of New York), MA, PhD (Illinois)  
P. M. Merikle, BA (Knox), MA, PhD (Virginia)  
S. Reinis, MD, SCs (Charles)  
M. A. Ross, BA (Toronto), MA, PhD (North Carolina)  
P. M. Rowe, BA (Toronto), MA (Dalhousie), PhD (McGill)  
D. A. Sprott2, BA, MA, PhD (Toronto), FSS  
R. A. Steffy, BA (Albright), MA, PhD (Illinois)  
M. D. Vogel-Sprott2, BA (McMaster), MA, PhD (Toronto)  
M. P. Zanna, BA, PhD (Yale)
Course Descriptions
Psychology

Associate Professors
R. J. Aiapack, BA (Scranton), MA, PhD (Duquesne)
D. M. Amorosko, 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 (Br. Col.), MA (Massachusetts), PhD (Wisconsin)
J. M. Cornell, BA, MS, PhD (Washington)
J. G. Holmes, BA, MA (Carleton), PhD (North Carolina)
P. J. Naus, BA, PhD (Nijmegen)
J. E. Orlando, BA (W. Ont.), MA (Detroit), MA, PhD (Michigan)
H. Ross, BA (Toronto), PhD (North Carolina)
K. H. Rubin, BA (McGill), MA, PhD (Penn State)
R. D. Seim, BA (Queen's), PhD (Waterloo)
R. V. Thysell, BA (Montana), MA, PhD (Iowa)
D. M. Willows, BA (Manitoba), PhD (Waterloo)
D. L. Wahlsten, BS (Alma College), PhD (California, Irvine)
E. E. Ware, BA, MA (Richmond), PhD (Illinois)

Assistant Professors
F. A. Allard, BA, BPE, MA, PhD (Waterloo)
N. Charness, BA (McGill), MS, PhD (Carnegie-Mellon)
R. H. Lahue, BSc (Fordham), PhD (Waterloo)
J. A. Van Evra, BA (Valparaiso), MA (Bowling Green), PhD (Michigan State)

Adjunct Professors
J. R. Amdur, BS (Portland State), MA, PhD (Denver)
D. S. Barnes, BA, MA (W. Ont.)
B. S. Francis, BS (Ursinus), MA, PhD (Arizona)
J. J. Hartford, MD (Toronto)
C. B. Lowry, BA (McGill), MA, PhD (Michigan State)
E. S. Lucy, BA (Hobart)
P. L. Ritchie, BA (McGill), PhD (Duke)
G. Summer-Smith, MRCVS, BVSc (Liverpool), FR-CVS, MSc (Guelph)
J. L. Williams, BA, MA (Alberta), PhD (Missouri)

Lecturer
J. Theis, BA (W. Ont.), MA (Notre Dame)

Faculty members holding cross appointments as shown:
1Sociology
2Statistics
3Kinesiology
4Counselling Services
5Environmental Studies
6Renison College
7St. Jerome's College

Course Descriptions
Psych 101 F.W,S 3C 0.5
Introductory Psychology
A general survey course designed to provide the student with an understanding of the basic concepts and techniques of modern psychology as a behavioural science.
Also offered at Renison College.

Psych 102 F.W,S 3C 0.5
Introductory Psychology Special Topics
A study in greater depth of selected broad issues and problems introduced in Psychology 101.
Also offered at Renison College.

Psych 102A
Applied Psychology
Applications of Psychological research to contemporary problems: man and environment, human factors engineering, management and organizations, crime and violence, and public health.

Psych 102B
Nature, Nurture and Human Behaviour
The role of heredity and environment in the development of intelligence, personality and personality disorders, and conflict and aggression.

Psych 102C
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
Psychology of Consciousness
Modes of thinking, emotion, creativity, and altered states of consciousness.

Psych 102E
Psychological Intervention
Applications of Psychology to human coping, problems and growth with emphasis on analyzing critically current treatment methods.
Offered at St. Jerome's College

Psych 200 F.W 3C,1L 0.5
Measurement in Psychology
The logic of measurement in Psychology. Descriptive procedures for collecting and handling data. Making inferences from test scores. The use of correlational procedures in measuring intelligence, achievement, aptitudes, interests and personality.
Psych 201  F,W  3C,1T  0.5  
**Statistical Methods in Psychology**
An introduction to data analysis. Topics covered include descriptive statistics and the logic and methods of inferential statistics with emphasis on applications in psychology. Little mathematics background is assumed.

Psych 202  W  3C,1T  0.5  
**Experimental Design**
An examination of the effective use and interpretation of statistics in design and understanding of experiments in the social sciences.  
Prereq: Psych 201

Psych 203  F,W,S  3C  0.5  
**Learning and Motivation**
This course is designed to introduce the student to theories in Learning and Motivation and to provide the student with an understanding of the experimental techniques in these areas.  
Prereq: Psych 101

Psych 206  F,W  3C  0.5  
**Perceptual Processes**
An examination of data and theory concerning perceptual processes. Topics will include the perception of form and space, perceptual learning and a consideration of the effect of personality variables in perception.  
Prereq: Psych 101

Psych 207  F,W  3C  0.5  
**Cognitive Processes**
An examination and evaluation of selected topics dealing with human learning, thinking, concept formation, memory and language.  
Prereq: Psych 101

Psych 211  F,W,S  3C  0.5  
**Developmental Psychology**
An examination of the process and factors of human development.  
Prereq: Psych 101  
Also offered at St. Jerome’s College

Psych 212  F,W,S  3C  0.5  
**Educational Psychology**
A consideration of the main variables affecting learning in the classroom with special focus upon the conditions essential to efficient learning.  
Prereq: Psych 101

Psych 213  F,W  3C  0.5  
**Exceptional Children**
Educational problems associated with mental retardation, emotional disturbances, sensory and physical impairments and intellectual giftedness.

Psych 214  F,W  3C  0.5  
**Psychology of Adolescence**
A study of the psychological processes in the second decade of human development. Consideration is given to such areas as intellectual, emotional and social growth, and identity formation. Current concepts, issues, and research are stressed.  
Prereq: Psych 211  
Also offered at St. Jerome’s College

Psych 218  F,W  3C  0.5  
**Aging, Dying and Death**
An examination of the psychological aspects of aging and the traditional and recent literature relating to various views on the reality of death in the life of man. Therapy with dying individuals is reviewed and evaluated.  
Prereq: Psych 101  
Offered at St. Jerome’s College

Psych 231  F  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  
Offered at St. Jerome’s College

Psych 236  F,W  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  F,W,S  3C  0.5  
**Social Psychology**
An introduction to theories and research on people in their physical and social environment. Typically, topics such as conformity, persuasion, attraction, prejudice, communication, aggression, the psychology of freedom, justice and human exchange will be introduced.  
Prereq: Psych 101  
Cross-listed as Psych 220R
Psych 254 W 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.
Prereq: Psych 253
Cross-listed as Psych 221R

Psych 258 F 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

Psych 261 F,W 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 experimental and clinical data are considered.
Prereq: Psych 101 or permission of instructor

Psych 271 F,W,S 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 293 F,W 2C,2L 0.5
Research in Learning and Motivation
Open only to students in a Psychology Programme (Honours, Joint Honours, General or Minor Programmes).
Prereq: Psych 201 and one of Psych 203 or 271

Psych 295 F,W 2C,2L 0.5
Research in Perceptual and Cognitive Processes
Open only to students in a Psychology Programme (Honours, Joint Honours, General or Minor Programmes).
Prereq: Psych 201 and one of Psych 206 or 207

Psych 297 W 2C,2L 0.5
Research in Biopsychology
Open only to students in a Psychology Programme (Honours, Joint Honours, General or Minor Programmes).
Prereq: Psych 201 and Psych 201
Psych 322  Y  2C  1.0
Principles and Practice in Early Childhood Education I
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 323  Y  3P  0.5
Practicum in Early Childhood Education I
Directed supervision with young children in group settings. The course requires 3 hours of field work per week. Must be taken concurrently with Psych 322.
Prereq: Acceptance into the Early Childhood Education and Care Option

Psych 331  W  3C  0.5
Individual Differences
An analysis of individual and group differences in behaviour, with emphasis on studies of intelligence.
Prereq: Psych 200 or Psych 301

Psych 333  F  3C  0.5
Industrial/Organizational Psychology
An introduction to the methods and problems in Industrial Psychology.
Prereq: Psych 101

Psych 334  F,W  3C  0.5
Theories of Counselling Psychology
An introduction to the methods, theories and problems in Counselling Psychology.
Prereq: Psych 101
Also offered at Renison and St. Jerome's Colleges

Psych 335  F,W  3C  0.5
Personality and Behaviour Change
Forms of psychological intervention that produce important changes in the way people think, feel and behave including psychoanalysis, behaviour therapy, brainwashing, cult conversions, deprogramming, hypnosis, biofeedback and meditation.
Prereq: Psych 101

Psych 339  W  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 programmes, labour relations, compensations systems.
Prereq: Psych 333

Psych 340  Community Psychology
Not offered 1981-82

Psych 341  F  3C  0.5
Psychology of Early Childhood Education
An introduction to theories and issues in early childhood education. Topics include issues differentiating preschool programmes and application of psychological theory/research to early education.
Prereq: Psych 211

Psych 350  Y  3C  1.0
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 stimulation.
Prereq: Psych 355, 357, and 334 or suitable alternative and permission of instructor
Offered at St. Jerome's College

Psych 353  W  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  W  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
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Term</th>
<th>Credit Hours</th>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Psych 355</td>
<td>F,W</td>
<td>0.5</td>
<td>Prereq: Psych 101</td>
</tr>
<tr>
<td>Personality Theory</td>
<td></td>
<td></td>
<td>Cross-listed as Psych 322R</td>
</tr>
<tr>
<td>Psych 356</td>
<td>W</td>
<td>0.5</td>
<td>Prereq: Psych 355</td>
</tr>
<tr>
<td>Contemporary Approaches to the Study of Personality</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Psych 357</td>
<td>F,W,S</td>
<td>0.5</td>
<td>Prereq: Consent of instructor</td>
</tr>
<tr>
<td>Psychopathology</td>
<td></td>
<td></td>
<td>Cross-listed as Psych 323R</td>
</tr>
<tr>
<td>Psych 358(A-Z) - 366 (A-Z)</td>
<td></td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>Special Subjects</td>
<td></td>
<td></td>
<td>One or more half courses will be offered at different times as announced by the Department.</td>
</tr>
<tr>
<td>Psych 370</td>
<td>W</td>
<td>0.5</td>
<td>Prereq: A minimum of two half courses in Psychology</td>
</tr>
<tr>
<td>Cross-Cultural Psychology</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Psych 372</td>
<td>F</td>
<td>0.5</td>
<td>Prereq: Consent of instructor</td>
</tr>
<tr>
<td>Environmental Psychology</td>
<td></td>
<td></td>
<td>Offered at St. Jerome's College</td>
</tr>
<tr>
<td>Psych 393</td>
<td>F,W</td>
<td>0.5</td>
<td>Prereq: Psych 201 and 211</td>
</tr>
<tr>
<td>Research in Development Psychology</td>
<td></td>
<td></td>
<td>Open only to students in a Psychology Programme (Honours, Joint Honours, General or Minor Programmes).</td>
</tr>
<tr>
<td>Psych 395</td>
<td>F,W</td>
<td>0.5</td>
<td>Prereq: Psych 201 and 253</td>
</tr>
<tr>
<td>Research in Social Psychology</td>
<td></td>
<td></td>
<td>Cross-listed as Psych 322R</td>
</tr>
<tr>
<td>Psych 397</td>
<td>F,W</td>
<td>0.5</td>
<td>Prereq: Psych 201 and one of Psych 355 or 357</td>
</tr>
<tr>
<td>Research in Personality and Psychopathology</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Psych 410</td>
<td>Y</td>
<td>1.0</td>
<td>Prereq: Consent of instructor</td>
</tr>
<tr>
<td>History and Systems</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Psych 422</td>
<td>Y</td>
<td>1.0</td>
<td>Prereq: Consent of instructor</td>
</tr>
<tr>
<td>Principles and Practice in Early Childhood Education II</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Psych 423</td>
<td>Y</td>
<td>0.5</td>
<td>Prereq: Consent of instructor</td>
</tr>
<tr>
<td>Practicum in Early Childhood Education II</td>
<td></td>
<td></td>
<td>Offered at St. Jerome's College</td>
</tr>
<tr>
<td>Seminars</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Psych 451</td>
<td>F</td>
<td>0.5</td>
<td>Prereq: Consent of instructor</td>
</tr>
<tr>
<td>Senior Seminar in Learning</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Psych 452</td>
<td>W</td>
<td>0.5</td>
<td>Prereq: Consent of instructor</td>
</tr>
<tr>
<td>Senior Seminar in Perception</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Psych 453</td>
<td>F,W</td>
<td>0.5</td>
<td>Prereq: Consent of instructor</td>
</tr>
<tr>
<td>Senior Seminar in Developmental Psychology</td>
<td></td>
<td></td>
<td>Also offered at St. Jerome's College.</td>
</tr>
</tbody>
</table>
Psych 454 W 2S 0.5
Senior Seminar in Educational Psychology
Admission by consent of instructor

Psych 455 F 2S 0.5
Senior Seminar in Social Psychology
Admission by consent of instructor

Psych 456 W 2S 0.5
Senior Seminar in Personality
Admission by consent of instructor
Also offered at St. Jerome's College

Psych 457 F,W 2S 0.5
Senior Seminar in Clinical Psychology
Admission by consent of instructor
Also offered at St. Jerome's College

Psych 458 F 2S 0.5
Senior Seminar in Cognitive Processes
Admission by consent of instructor

Psych 459 Senior Seminar in Motivation
Not offered 1981-82

Psych 461 W 2C 0.5
Senior Seminar in Physiological Psychology
Admission by consent of instructor

Psych 462 F 2S 0.5
Senior Seminar in Animal Behaviour
Admission by consent of instructor

Psych 463 (A-Z) 2S 0.5
Senior Seminar in Special Topics
Admission by consent of instructor

Psych 464 (A-Z) 2S 0.5
Senior Seminar in Special Topics
Admission by consent of instructor

Psych 465 (A-Z) 2S 0.5
Senior Seminar in Special Topics
Admission by consent of instructor

Psych 466 (A-Z) 2S 0.5
Senior Seminar in Special Topics
Admission by consent of instructor

Psych 480 Y,M 3R 1.0
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. Also offered at St. Jerome's College

Psych 498 Y,M R 1.0
Senior Honours Essay - Review Paper
Each student will work under the direction of a member of the department on a critical integrative review of an issue in research literature. The result of this review will be presented in the form of a thesis, which will be critically examined by members of the department.
Also offered at St. Jerome's College

Psych 499 Y,M R 1.0
Senior Honours Essay - Experimental Study
Each student will work under the direction of a member of the department on an experimental study. The result of this investigation will be presented in the form of a thesis, which will be critically examined by members of the department.
Also offered at St. Jerome's College

The following courses are administered by Renison College. Since these courses are intended primarily for students in the Social Development programme, students planning a General or Honours Psychology programme must consult their faculty advisor concerning Psychology major credit for these courses.

Psych 120R/121R F,W 3C,3C 0.5,0.5
Introductory Psychology

Psych 220R F 3C 0.5
Social Psychology

Psych 221R W 3C 0.5
Interpersonal Interaction

Psych 322R F 3C 0.5
Personality (Personality Theory)

Psych 323R W 3C 0.5
Abnormal Psychology (Psychopathology)

Psych 367R-369R
Special Topics in Psychology

Psych 369R W 3C 0.5
Advanced Topics in Counselling Psychology

Psych 398R/399R S,F,W/S,F,W R 0.5/0.5
Independent Study
(Open to senior Social Development Studies majors only)
Course Descriptions

Recreation

Rec 100 F 3C 0.5
Introduction to the Study of Leisure and Recreation
An overview of the total field of recreation emphasizing the understanding of leisure phenomena and implications for contemporary society.

Rec 101 F,W 2C,1T 0.5
Introduction to Leisure Services
An introduction to various leisure service agencies and the services provided. Field trips to municipalities, specialized institutions, and voluntary agencies.

Rec 200 F,S 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,S 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,S 3C 0.5
An Introduction to the Sociology of Sport (Kin 252)
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.
Prereq: Soc 101 and Rec 201

Rec 204 S 3C 0.5
Leisure and Recreation in Historical Perspective
Analysis of socio-cultural determinants which have influenced Canadian Leisure behaviour.
Prereq: Rec 100 or consent of instructor

Rec 210 F,W 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,W  2C,2L  0.5
*Recreation Programme Development*
A study of the scope of community recreation programmes and the factors involved in programme leadership. 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  F,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 241  S  3C  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.

*Prereq: Rec 230*

Rec 250  F,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 252  W,S  3C  0.5
*Recreation and Mental Retardation*
An analysis of the motoric and psycho-social behavioral dimensions specific to the retarded with direct and obvious applicability to the planning, implementing and evaluating of recreational programmes.

*Prereq: Rec 250, Psych 242*

Rec 253  W  3C  0.5
*Recreation and Physical Disabilities*
The psycho-social aspects of physical disabilities will be analysed, with special focus given to the planning, implementing and evaluating of leisure activities.

*Prereq: Rec 250, permission of instructor*

Rec 254  W,S  3C  0.5
*Recreation and Mental Health*
A psycho-social analysis of the determinants and consequences of recreative behaviour as related to positive and negative mental health, discussing in detail, structure, semiotic factors and interaction patterns.

*Prereq: Rec 250*

Rec 270  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 300  W  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  S  3C  0.5
*Sociology of Leisure (Soc 347)*
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: Two term courses in Sociology*

Rec 302  F  3C  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.

*Prereq: Rec 301*

Rec 306  W,S  3C  0.5
*Psychodynamics of Leisure Behaviour*
Examination of the psychodynamics of popular leisure experiences, e.g. - sport, gambling, fashion, and the like, and their relationship to psychopathology. Examination of the use of leisure experience to resolve emotional conflict and cope with stress.

*Prereq: Rec 301, Psych 357*

Rec 307  W,S  3C  0.5
*Social Psychology and Physical Activity (Kin 354)*
An examination of the social influences and group processes which occur within sport teams. Topics include conformity, the influence of onlookers, and co-actors, leadership, group structure, and cohesion.

*Prereq: Psych 101*
Rec 311 W 3C 0.5  
**School Recreation**
An analysis of the relationship between recreation and education with particular emphasis on the sponsoring of community recreation programmes 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 316 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 a full credit in Geography, or consent of instructor*

Rec 320 S 2C,2L 0.5  
**Evaluation of Recreational Programmes**
Evaluation procedures and techniques applicable to recreation programmes 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 270*

Rec 321-329 0.5  
**Selected Topics in Recreation**
The study of particular topics pertaining to recreation. Course topics will be announced in advance, but will not be offered on a regular basis.
*Prereq: Consent of instructor*

Rec 331 F 2C,2L 0.5  
**Outdoor Education in Recreation**
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  
**Theory and Practice in Outdoor Recreation**
Emphasis on methods and techniques for the selection, development, and implementation of programmes and projects through the utilization of diverse and unique natural settings and environments.
*Prereq: Rec 230*

Rec 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 210, Rec 230 or equivalent*

Rec 361 W,S 3C 0.5  
**Aging and Leisure**
Social parameters of the aging process with particular reference to the Leisure Service Industry.
*Prereq: Rec 301*

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 research and/or reading. A faculty member must approve a student’s project prior to registration. May be repeated once in a subsequent term.
*Prereq: Faculty approval*

Rec 371 F,W 3C 0.5  
**Research Designs Applicable to Leisure Studies**
An introduction to the methods and techniques of research as applied to leisure studies and services. General consideration will be given to the technical problems involved in various stages of research methodology with emphasis on the logic underlying the research process.
*Prereq: Rec 270*

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.*

Rec 400 W 3C 0.5  
**Seminar in Recreation and Leisure**
An in-depth analysis of the current major issues and trends.
*Fourth year Departmental students only*
Rec 402 Colloquium on Religion and Leisure
Not offered 1981-82

Rec 406 S 1.0
Comparative Recreational Systems
A study of multi-national recreation systems. Course meets on Campus and in the field in other countries. Full term study over a period of 6-8 weeks. Laboratory fee varies with field observation.

Rec 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 consent of instructor

Rec 432 F 3C,1L 0.5
Interpretation
Concepts, philosophy and practices of interpretation relative to understanding the use of the natural environment.
Prereq: Rec 332 or consent of the instructor

Rec 434 W 3C 0.5
Advanced Park 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.
Prereq: Rec 334

Rec 435 F 3C 0.5
Recreation Resource Policy
A study of policies, policy development and policy gaps related to recreation resources in Canada. Based on a literature review and discussion of decision-making procedures, roles and tools used in the recreation field; students are required to research real and theoretical situations for seminar presentation.
Prereq: Rec 100 and Rec 230 or consent of instructor

Rec 470/471 F,W,S 3C 0.5
Research Project
An independent research project on an approved topic supervised by a faculty member. Required of all students enrolled in the Honours Recreation Programme.
Rec 470 includes an approved design and completion of the first segment of the paper.
Prereq: Rec 270, 371
Rec 471 requires the completion of the project begun in 470.

Rec 580 2C,2D 0.5
The Dynamics of Tourism
An examination of the behaviour factors which influence the tourist; the research methodologies employed to examine these factors; and the relationship between tourism and other aspects of leisure behaviour.
Prereq: Rec 302 or equivalent, and a course in statistics. Open to advanced undergraduate students and graduate students.
Course Descriptions

Religious Studies

Note

Numbers below the course description indicate the area of Religious Studies to which the course belongs. Refer to page 114 in programme section.

RS 100A-K Introduction to Religion
An introduction to Religion, religious phenomena, beliefs, ideas, practices and experience through the study of material and examples from the various fields in Religious Studies.

RS 100B W 3C 0.5
Religions of the East
An introduction to the religious traditions of the East: history, religious beliefs and practices of Hinduism, Buddhism, Confucianism, Taoism and Shinto.
Area 1, Thompson and Legge

RS 100C F 3C 0.5
Religious Quests
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, Bryant

RS 100D W 3C 0.5
Religious Movements
A consideration of religious movements, old and new, inside as well as outside the traditional churches. Also, an exploration of religiously-inspired cultural movements in the social, political and artistic realms of society.
Area 5, Bryant

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, Miller
Course Descriptions
Religious Studies

R S 100F  F,W  3C  0.5
Biblical Studies II
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, Hubbard

R S 100H  F  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, MacDonald

R S 100K  F,W  3C  0.5
Protestant Theology
An introduction to the study of the sources and issues of traditional and contemporary, liberal and conservative, Protestantism.
Area 4, Gérard

R S 106  Y  3C  1.0
New Testament Greek
This course will consist of two parts:
a) An introduction to Greek grammar with appropriate grammatical exercises and development of vocabulary,
b) An exegetical study of the Greek text of the Synoptic Gospels, with Mark as the basis.
Area 3, Shillington

R S 200  A,F  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.
Note: Open to RS majors only, Legge

R S 203  W  3C  0.5
Wisdom, Literature in the Old Testament
A study of Proverbs, Job, Ecclesiastes and other wisdom writings in ancient Israel, against their near Eastern background.
Area 3, Miller

R S 205 The Hebrew Prophets
Not offered 1981-82.

R S 206  F  3C  0.5
Modern Study of Jesus
An examination of recent approaches to the study of Jesus of Nazareth to determine his significance for the beginnings of the Christian Church and for modern man.
Area 3, Miller

R S 208  W  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, Miller

R S 209  F  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, Hubbard

R S 210  F,W  3C  0.5
Women and the Great Religions
This course aims at a global view of the experience of women in the religious traditions of East and West. It attempts to hear and respond to feminist questions about the nature and influence of religion.
Area 1, Thompson

R S 213 Hinduism
Not offered 1981-82.

R S 214  A  3C  0.5
Buddhism
An introduction to the unifying beliefs and philosophical presuppositions of the Buddhist worldview, and an overview of the diverse forms of Buddhism in South and South-East Asia, Tibet, China and Japan.
Area 1, Legge

R S 215  W  3C  0.5
Religion in China
An historical overview of the primary expressions of Chinese spirituality, from the Ancient Period to the 20th century. Special attention will be given to the interaction between the indigenous traditions (folk religion, Confucianism, Taoism) and Buddhism.
Area 1, Legge

R S 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, Sahas
R S 217 F 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, Sahas

R S 218 F 3C 0.5
Christianity
An introduction to the Christian tradition in retrospect; the facts and the experiences pertinent to the evolution of beliefs, institutions, practices and cultural expressions, as these elements delineate the essential identity of Christianity as one of the religious traditions of the world.
Area 1, Sahas

R S 220 F 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, Sawatsky

R S 221 W 3C 0.5
Minority Religions in North America
A consideration of North American religion through the study of a variety of religious groups, such as Mormons and Missionaries, Scientologists and Presbyterians, Amish and newly emergent religions.
Area 2, Sawatsky

R S 227 (Hist 235) F 3C 0.5
History of Christianity 1
The development of Western and Eastern Christianity to the end of the medieval period.
Area 2, Klaassen

R S 228 (Hist 236) W 3C 0.5
History of Christianity 2
Roman Catholicism, Eastern Orthodoxy and Protestantism from the Reformation to the present.
Area 2, Klaassen

R S 231A F 2C,1S 0.5
The Evolution of Christian Thought 1
An analysis of the major theological developments in the Christian traditions from the apostolic era to the Reformation. Major documents of the Greek and Latin patristic literature are analysed.
Area 4, Bryant

R S 231B W 0.5
The Evolution of Christian Thought 2
An analysis of the major theological developments in the Christian traditions from the Reformation to the present.
Area 4, Bryant

R S 232A F 2C,1S 0.5
Jesus Christ in Contemporary Perspective
An examination of current approaches to the person of Jesus through the writings of contemporary theologians attempting to answer the question, “Who is Jesus?”
Area 4, MacDonald

R S 232B W 2C,1S 0.5
Jesus Christ in Historical Perspective
An examination of the historical development of the doctrine about 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, MacDonald

R S 235 S,F 2C,1D 0.5
Moral Consciousness: Theory and Practice
A study in moral theology of current social problems. Concrete possibilities for individual and corporate initiatives toward needed social change will be stressed.
Prereq: Second year standing or consent of instructor.
Area 4, Gérard

R S 236 S,J 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, Bildstein

R S 238A The Ecumenical Movement
Not offered 1981-82.

R S 238B The Ecumenical Movement
Not offered 1981-82

R S 253 History and Thought of Christian Pacifism
Not offered 1981-82.

R S 254 W 3C 0.5
History and Thought of Christian Pacifism 2
The Contemporary Discussion. A survey of Christian teaching on war and peace, focusing on the twentieth century discussion.
Area 4, Sawatsky
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 decisions.
Area 4, Legge

Issues in Science, Technology and Religion
An exploration of the theoretical and practical aspects of the interaction of religious beliefs and practice with science and technology around the ethical questions associated with nuclear power, genetic engineering, information processing, and environmental issues.
Area 5, Legge

Religion and Politics
Examines the relationship of religion and politics in contemporary societies. Areas of concentration may include the encounter of Christianity and Marxism, the Confessing Church in Nazi Germany, Christian Socialism and the Social Gospel.
Area 5, Bryant

Religion in the Canadian Experience
An examination of the role of religion in Canadian immigration and settlement, education and social reform, political and national identity, secularization and pluralism.
Area 5, Sawatsky

Unity in Diversity in Canadian Religion
A study of the interaction of historical, social, economic, and political factors in Canada with the development of the Church – the uniting and dividing forces.
Area 5, Gérard

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 246(R)
Film fee $5.00
Area 5, Bird

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 247(R)
Film fee $5.00
Area 5, Bird and Bryant

Religious Perspectives in Contemporary Literature
A discussion of religious perspectives in contemporary literary works. Emphasis will be on religious pluralism as reflected in the culture with a primary focus on man's search for meaning, both individually and culturally.
Area 5, Bryant

Religious Perspectives in Contemporary Canadian Literature
Not offered 1981-82

Myth & Symbols of the Religions of India
An approach to understanding symbols and perennial themes of Indian religion through a study of representative art, architecture and folk-literature of Hinduism, Indian Buddhism and Jainism.
Area 1, Thompson

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, Evans

Personality and Religion
A study of the psychology of personality in its relationship between personality and religious thought, experience and behaviour.
Area 5, Van Katwyck

Religious Approaches to Personal Crises
A critical historical review of Judaeo-Christian approaches to emotional and interpersonal problems, with an analysis of the clinical pastoral education movement in the church.
Area 5, Lebold
Religion and Psychotherapy
A review and analysis of the dialogue between theistic religion in the West and the personality sciences since Freud: their respective views of God, man, sin, sickness and the therapeutic process. Clinicians and theorists in psychotherapy and religion from the surrounding community will contribute to the exploration.
Area 5, Miller

Theology of Worship and Sacrament
The course will examine Christian corporate worship in its existential reality and historical development. New trends will be analyzed in the light of both tradition and present needs.
Area 4, Gérard

New Perspectives in Sacramental Theory
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 cultic signs in contemporary Roman Catholicism.
Prereq: Second year standing or consent of instructor.
Area 4, MacDonald

The Gospel of John
An interpretation of the Fourth Gospel in the light of the situation of the Church at the end of the first century, with an emphasis on the Johannine portrait of Jesus. The letters of John will also be studied.
Area 3, Hubbard

Intermediate New Testament Greek
Not offered 1981-82

Selected Topics in Biblical Theology
Special topics will be offered, Spring and Winter, 1981-82. Consult Department.

The New Testament World
Not offered 1981-82

New Testament Themes
A comparative study of the distinctive ways in which New Testament writers view key issues in the early Church; e.g., freedom and authority, social responsibility, the role of law, relations with the Jewish religion, the person of Jesus. An attempt will be made to relate their views to issues facing Christianity today.
Prereq: R S 100F or consent of instructor.
Area 3, Hubbard

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: R S 100A or consent of the instructor.
Area 1, Thompson

Radical Reformation 1
A study of spokesmen for radical reform of the Church including Andreas Caristadt, Thomas Müntzer, Caspar Schwencckfeld, Sebastian Franck, Michael Servetus and others.
Prereq: Second year standing.
Area 2, Klaassen

Radical Reformation 2
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, Klaassen

Medieval Church History from 312 to 1096
(Cross-listed as Hist 302)
Area 2, Wahl

Medieval Church History from 1096-1449
(Cross-listed as Hist 303)
Area 2, Wahl
The Orthodox Church
A study of "Eastern" Christianity; its history, theology, culture, spiritual experience, and its situation in modern Greece, Russia, Eastern Europe, the Middle East, and in the West.
Prereq: R S 100B, or 218 or consent of the instructor.
Area 2, Sahas

R S 326 Anglicanism
Not offered in 1981-82

R S 331A W 3C 0.5
The Church in the Modern World
A study of the recent transformations of the Roman Catholic Church through the events, movements, personalities, and historical realities of the past fifty years.
Prereq: H S 100C/100D or 100H/100K and a 200-level course in theology or history of Christianity.
Area 2, MacDonald

R S 331B The Church in the Modern World
Not offered 1981-82

R S 334 Islamic Theology, Philosophy and Mysticism
Not offered in 1981-82

R S 336A W 3C 0.5
Contemporary Theology 1
A study of: a) the sources of contemporary theology in 18th and 19th century thought, with particular reference to Kant, Schleiermacher, and Kierkegaard; b) selected 20th century theologians, including Buber, Barth, Tillich, Bonhoeffer, and Teilhard de Chardin.
Prereq: R S 100H or 100K or consent of instructor.
Area 4, Legge

R S 336B Contemporary Theology 2
Not offered 1981-82

R S 337 Process Theology
Not offered 1981-82

R S 339 Luther and Calvin: The Reformation in
Theological Outline
Not offered 1981-82

R S 350 Christian Spirituality and Mysticism
Not offered in 1981-82

R S 360 F 3C 0.5
Religion and the Arts 1
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, Bird

R S 361 Religion and Art 2
Not offered in 1981-82

R S 365 Religious Issues in Marxism
Not offered 1981-82

R S 369A In the Footsteps of the Christian Tradition
Not offered 1981-82

R S 369B-F Study-Travel Seminars in Religion
Not offered 1981-82

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: R S 271 or consent of instructor.
Area 5, Evans

R S 371 F 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: R S 271 or consent of instructor.
Area 5, Evans

R S 398-399
Directed Reading in Special Subjects
R S 400A-H
Special Topics in Religious Studies
Special topics will be offered in terms J and W, 1981-82. Consult Department.
Course Descriptions
Religious Studies
Science

RS 490 1.0
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.

Note
Every student in the Honours RS Programme is required to take this seminar.

RS 590-597 F,W R 0.5
Directed Research in Special Subjects for Graduate Students

RS 598-599 R 0.5 each
Directed Reading in Special Subjects for Graduate Students

†Students wishing to enrol in a course marked with a dagger (†) should consult the department.

Faculty of Science

The Faculty of Science offers the following courses of a general nature, intended for students registered in other Faculties (Arts, Environmental Studies, Engineering, Mathematics, Human Kinetics and Leisure Studies) as well as for Science students desiring electives. Normally, no more than four of the Science credits may be applied towards any Science degree programme.

Sci 100 F,W 3C 0.5
Introduction to the Geology of Canada
Basic principles of Geology presented and illustrated with Canadian examples. Earth materials; the Earth's interior; volcanoes and earthquakes; the Earth's surface and its evolution; the history of life; application of geology to man's use of the environment. Field trips. (Not normally available to students in Earth Sciences programmes)

Note
Students desiring a full-year Geology elective should consider Earth 121-122 (Introductory Geology) to be found in the listings of the Earth Sciences Department. Students who are taking, or who have taken Earth 121-122 may not take Sci 100 for credit because of overlapping material.

Sci 110 F 3C 0.5
From Matter to Man
Astronomy and Earth Science. A special course available to Math students who do not have a strong Science background. Not open to students registered in the Faculty of Science.
No prereq. A special division of this course may be offered to first year Eng. students in other terms if sufficient demand exists.

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.
6 weeks.
6 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 5 level. Not open to students registered in the Faculty of Science.
No prereq.
Sci 120  The Physical Sciences
Not offered 1981-82

Sci 200  F  3C  0.5
Contemporary Science 1
The interaction between science and society will be discussed for several items of contemporary public interest. Recent topics have included noise pollution, its reduction and control; materials, structures and properties; atmospheric science, weather and climate; nuclear fission, new future or no future; outer space exploration, its effects on the activities of man; low temperature phenomena, their impact on society. Open to students in the Faculties of Arts, Environmental Studies, Human Kinetics and Leisure Studies, Mathematics and the Programme of Integrated Studies in the first as well as upper years.

Sci 201  W  3C  0.5
Contemporary Science 2
(Students registered in Science or Engineering may not take this course for credit)

Sci 202  F  3C  0.5
Energy
Prereq: At least one year of Secondary School Physics

Sci 203  W  3C  0.5
Applied Physics in the Modern World
Selected topics in the applications of physics such as acoustics, cosmology, fusion, health physics, lasers and holography, oceanography, physics in Canada, reactor physics, space research, superconductivity, symmetry.

Sci 205  F,W  2C,2L  0.5
Physics of High Fidelity Sound Reproduction
This course applies elementary physical principles to the study of high fidelity systems. A set of laboratory experiments designed to familiarize the student with basic components is included. The course will convey an appreciation of the physics of such systems and an understanding of the specifications of modern equipment.
Prereq: None, Lab, alternate weeks

Sci 209  F,W  2C  0.5
Information
Information is considered from two points of view: (1) the information explosion and you: the nature of the scientific, technical and social sciences literature. Retrieval of information: use of libraries and computers. (2) Imparting the information you have to others: the art of speaking, and writing scientific papers, reports, letters, etc. Common errors in writing.
No prereq.

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,W,S  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 Eng, Math or Sci students).

Sci 238  F,W,S  3C  0.5
Descriptive Astronomy
A survey course in astronomy intended for Mathematics, Engineering and Science students. The solar system, stars, the galaxy, galaxies and the universe. Open to first year or upper year students. (Students in Honours Physics may not take this course for credit.)
No prereq. A special division of this course may be offered in the Winter and/or Spring term primarily for Eng. students if sufficient demand exists.
Note
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. In addition, students who have
taken Physics 250 and/or Physics 251 may not take
Sci 237 or 238 since Physics 250/251 covers the
same material at a much more advanced and
comprehensive level. Students with a weak
background in Physics and Mathematics may well
find it advisable to take Sci 238 for credit before
taking Physics 250/251 for credit.

Sci 249 W 3C 0.5
Continents Adrift
A new look at earth from the viewpoint of plate
tectonics. The geophysical evidence for this concept
is reviewed, as are its implications for such diverse
phenomena as earthquake prediction, geomagnetic
reversals, mineral exploration, the evolution of life,
and the geology of Canada.
(Students whose major field is Earth Sciences may
not take this course for credit).

Sci 250 W 3C 0.5
Environmental Geology
The influence of geological factors on the natural
environment: natural hazards; effects 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).

Sci 251 F 2C 0.5
Human Genetics
An examination of recent advances in human
heredity including the genetic, 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).

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 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. Open to first year or upper year students.
(Students whose major field is Biology may not take
this course for credit.)
Sci 351  F  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 mechanism of action of nerves, muscles, the cardiovascular and respiratory systems.
Prereq: None
Offered only by Correspondence for 1981-82.

Sci 352  W  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.
Prereq: None
Offered only by Correspondence for 1981-82.

Sci 353  F  2C  0.5
The Plants of Canada
The composition, ecology and history of Canada's flora. The role of plants in our environment, their use by native peoples and in modern agriculture and horticulture ethnobotany. An introductory course for non-biologists on the natural history of our flora.

Sci 355  F  3C  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). Not open to students who have taken Sci 351.

Sci 400A  F  2C  0.5
The History of Science 1
The development of scientific concepts from the Renaissance to the early 19th century. Astronomy from Copernicus to Newton, physics from Galileo to Newton. The physics and biological sciences during the 18th century. Lavoisier and La Révolution Chymique. The beginnings of the industrial revolution. Emphasis will be on reading the works of the originators of Science.
Prereq: First year Science or equiv.

Sci 400B  W  2C  0.5
The History of Science 2
The growth of scientific ideas in the 19th and early 20th centuries. Developments in physics, chemistry, geology, biology (particularly Darwin) and technology. Emphasis will be on reading the works of the originators of science.
Prereq: First year Science or equiv.
Social Development Studies

Professor Emeritus
D. G. S. M’Timkulu, BA, MA (South Africa), MA (Yale), PhD (Natal) R

Professors
I. L. Campbell, BA (Carleton), MSc (London School of Economics) R
J. O. Towlcer, BA (Toronto), MEd, PhD (Alberta) R

Associate Professors
J. T. Harris, BMus (Temple), MSW (Pennsylvania) R
M. I. Nagler, BA (Br. Col.), MA (Chicago), PhD (Stirling) R

Assistant Professors
R. Lahue, BSc (Fordham), PhD (Waterloo) R
M. Smyth, BA (Toronto), MA, PhD (York) R
M. Zentner, BA (Temple), MSW (Kansas) R

Co-ordinator of Placements-Diploma Programme
F. Promoli, BA (McMaster), Dip (Soc. Sci.) (Toronto) R

Associated Faculty
Assistant Professor, Religious Studies
M. Bird, BA, MA, PhD (Iowa) R

Associate Professor, Religious Studies
D. Bryant, BA (Concordia College), STB (Harvard), MA, PhD (St. Michael’s) R

Associate Professor, Geography
B. Hyma, BSc, MSc (Madras), MA (Sheffield), PhD (Pittsburgh) R

Assistant Professor, History
W. Packull, BA (Guelph), MA (Waterloo), PhD (Queen’s) R

Professor, English
H. Tuyn, BA, MA (Oxford), MA (Utrecht), Docteur de l’Université de Paris R

Co-ordinator of English Language Programmes
J. Millor, BA, BLS (McGill), MA, MPhil (Waterloo)

Course Descriptions

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 3C 0.5
Lifespan Crises: Introduction to Helping Strategies
Introductory examination of theories and research related to crises in the human lifespan, and strategies of the helping professional for prevention and intervention. Topics include: symbiosis, separation, identity crises, autonomy, stress, self-control.

ISS 220R The History of Development of Modern Day Social Problems
Not offered in 1981-82

ISS 221R Community Issues
Not offered in 1981-82

ISS 231R W 3C 0.5
Social Ideas, Social Policy and Political Practice 2
Concentration will be on selected social and political ideas of the 19th and 20th centuries and their influence on social policy and political practice in contemporary Canada.
Prereq: ISS 131R

ISS 250R F 3C 0.5
Social Research 1
Introduction to the philosophy and methods of applied social science, the problems and strategies of research design and analysis. Emphasis on collection, statistical analysis, and descriptive presentation of research data using a variety of quantitative methods.

ISS 251R W 3C 0.5
Social Research 2
A continuation of ISS 250R
Prereq: ISS 250R

ISS 320R F 3C 0.5
Critical Encounter with the Study of Man
An attempt to develop a critical sense of the relevance of the social sciences to man. Special attention to men, theories and methodologies at the "cutting edge" of the social sciences, with emphasis on those taking an interdisciplinary approach.
Prereq: Courses in at least two of the social sciences or consent of instructor.
ISS 343R F,W 3C 0.5
Interdisciplinary Investigation of Human Sexuality
Content will focus on the sex research of Kinsey, Masters and Johnson, and will examine areas of import for human sexuality theory and therapy. Current sexual myths will be explored. The clinician's role in changing individual and societal attitudes and sanctions regarding sexual behaviour will be examined.

ISS 350a The Non-Medical Use of Drugs, Drug Dependency and Its Management
Not offered in 1981-82

ISS 350b W 3C 0.5
Problems of Adult Education from the Perspective of the Social Sciences
An interdisciplinary examination and analysis of adult education in Canada with particular reference to the local situation and its historical development, philosophical, psychological and sociological foundations. Political policies, practices, trends, and the status of adult education will be covered.

ISS 398R/399R S,F,W/S,F,W R 0.5/0.5
Independent Study
Interdisciplinary focus, in greater depth than is available in other courses, on a selected area of concern to the student. Available to individuals or small groups of third or fourth year Social Development Studies students and arranged with one of the programme's faculty members.
Prereq: Permission of Undergraduate Officer

ISS 469R Y 2S 1.0
Senior Seminar Workshop
Social and human phenomena will be examined holistically. Students will be encouraged to synthesize knowledge learned in other social science courses in an intensive study of specific social issues and human concerns. The issues examined will vary from year to year reflecting social change, immediate community concerns, developments in the social sciences and the interests of students and instructors. Students will be required to engage in field projects, including community based learning experiences.
Prereq: Open to senior honours students only

ISS 499R Y T 1.0
Senior Honours Essay
The essay will normally be related to the student's chosen theme area, supervised by only one faculty member, but critically examined by faculty from all areas of the programme.
Prereq: Open to senior honours students only

Psych 120R F 3C 0.5
Introductory Psychology
Basic concepts and techniques of modern psychology as a behavioural science. The development of behaviour, learning and remembering, motivation, values and attitudes, personality, sensation and perception, and small group processes will be studied with reference to physiological correlates.

Psych 121R W 3C 0.5
Introductory Psychology (Special Topics)
A more in-depth study of selected topics introduced in Psych 120R.
Prereq: Psych 120R

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.
(Cross-listed with Psych 253)
Prereq: An introductory psychology course

Psych 221R W 3C 0.5
Interpersonal Interaction
A consideration of selected theories of interpersonal interaction. Topics include E. Goffman, non-verbal communication, H. S. Sullivan, transactional analysis, the double-bind theory, R. D. Laing, the basic dimensions of interpersonal behaviour, and social exchange.
(Cross-listed with Psych 254)
Prereq: Psych 220R or Psych 253

Psych 322R F 3C 0.5
Personality (Personality Theory)
An examination of the major theories of personality including consideration of the psychoanalytic, dispositional, humanistic, and behaviouristic models.
(Cross-listed with Psych 355)
Prereq: An introductory psychology course

Psych 323R W 3C 0.5
Abnormal Psychology (Psychopathology)
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.
(Cross-listed with Psych 357)
Prereq: An introductory psychology course
Psych 334  S,F  3C  0.5
Theories of Counselling Psychology
An introduction to the theories, methods and problems in Counselling Psychology.
Prereq: An introductory psychology course

Psych 367R-369R  0.5 each
Special Topics in Psychology
One or more half courses will be offered from time to time as announced by the Social Development Studies Programme. Subjects will be dependent upon special research and/or instructional interests of faculty.

Psych 369R  W  3C  0.5
Advanced Topics in Counselling Psychology
An in-depth study of special topics arising in Psych 334 (R)
Prereq: Psych 334 (R)

Psych 398R/399R  S,F,W/S,F,W  R/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 programme.
Prereq: Permission of Undergraduate Officer

Sociology

Soc 120R  W  3C  0.5
Fundamentals of Sociology 1
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.

Soc 121R Fundamentals of Sociology 2
Not offered in 1981-82

Soc 220R The Individual, Society and Religion
Not offered in 1981-82

Soc 221R  S,W  3C  0.5
Master Trends in Modern Society
An introduction to the major problems of urbanization and industrialization in modern societies studied within a framework emphasizing social change. Illustrations will be drawn from emergent as well as advanced societies.
Prereq: Introductory Sociology course

Soc 225R Race and Culture in the Third World 1
Not offered in 1981-82

Soc 226R Race and Culture in the Third World 2
Not offered in 1981-82

Soc 325R/326R Issues in Third World Development
Not offered in 1981-82

Soc 327R/328R  F/W  3C/3C  0.5/0.5
Canadian Ethnic and Cultural Minorities
A detailed examination of various minorities in Canadian society. The first section of the course will stress the fundamental concepts and issues of race and ethnic relations and the final segments of the course will incorporate the application of these fundamentals to the various groups in the Canadian mosaic.
Prereq: second year standing 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

Soc 398R/399R  F,W/F,W  R/R  0.5/0.5
Independent Study
An independent in-depth study of a selected area of concern to the student within the discipline of sociology. Available to individuals or small groups of third or fourth year Social Development Studies majors and arranged with one of the faculty members from the programme.
Prereq: permission of Undergraduate Officer
Social Development Studies

Social Work

Soc wk 120R S,F,W 3C 0.5
Introduction to Social Work
An introduction to the methods, values and concepts of social work. A broad survey of methods of social work practice; casework, group work, community organization, family therapy, etc. An overview and development of social work settings; public assistance, mental health services, welfare services, etc.

Soc wk 121R W 3C 0.5
Social Problems
A study of contemporary social problems with which social work is concerned. Emphasis is divided between theoretical approaches to understanding the problems and study of societal responses to and intervention in the problem.

Soc wk 220R S,F 3C 0.5
Social Casework 1
A presentation of some of the theoretical constructs necessary for the understanding of the individual in the casework relationship, as well as an introduction to some appropriate casework interventions. Emphasis in the course will be theoretical.
Prereq: Soc wk 120R or consent of instructor

Soc wk 221R S,F 3C 0.5
Social Group Work and Family Therapy 1
Presentation of some of the theoretical constructs necessary for the understanding of the family and the group in the social work relationship, as well as an introduction to some appropriate social group work and family therapy interventions. Emphasis will be theoretical.
Prereq: Soc wk 120R or consent of instructor

Soc wk 222R F 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: Soc wk 120R or consent of instructor

Soc wk 320R S,W 3C 0.5
Social Casework 2
A methodological examination of some of the more complex intellectual components in the social work skills necessary to work with individuals in casework. Social work theories of the individual will be examined in order for the students to learn some clinical casework applications.
Prereq: Soc wk 220R, or consent of instructor

Soc wk 321R S,W 3C 0.5
Social Group Work and Family Therapy 2
A methodological examination of some of the more complex intellectual components of some of the social work skills necessary to work with families and groups. Social work theories of the family and of the group will be concretized in order for the student to learn some clinical applications.
Prereq: Soc wk 221R, or consent of instructor

Soc wk 322R W 3C 0.5
Community Organization 2
An examination of social change tactics as they have been operationalized by individuals and groups committed to the social work ethos. This course will concentrate on the Canadian scene and such diverse formations as social work unions, collective action by welfare recipients, political parties, etc.
Prereq: Soc wk 222R, or consent of instructor

Soc wk 326R W 3C 0.5
History of Social Welfare
The historical development of the religious, philosophical, technological and cultural bases of social welfare services from early civilization to the modern welfare state.
Prereq: Soc wk 120R, or consent of instructor

Soc wk 350 (A-F)
Special Topics in Social Work
One or more half courses will be offered from time to time as announced by the Social Development Studies Programme. Subjects will be dependent upon special research and/or instructional interests of faculty.

Soc wk 350A S,F 3C 0.5
Mental Retardation and the Family
A critical application of 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.

Soc wk 355R S,F,W 3C 0.5
Child Abuse: Identification and Treatment
The objectives of this course are to provide an understanding of the dimensions and causes of child abuse, to develop skills in identifying cases of this social problem and to explore current methods of management and treatment of persons involved in child abuse situations.
Prereq: Soc wk 120R or consent of instructor
Medical Social Work
An analysis of the social work function in a medical setting, with emphasis on the contribution of social work in identifying and treating the emotional component of illness. Areas of study will cover the growth of medical social work and development of social work departments in the complexity of a hospital. An examination of various types of in-patient individual and group services. An exploration of social work's responsibilities and opportunities for influencing community public health programmes and issues.
Prereq: Socwk 120R or consent of instructor

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 programme.
Prereq: Permission of Undergraduate Officer

Elective Courses
The following elective courses are administered by Renison College. For fuller descriptions, see appropriate departments.

Arts
Arts 220R Chinese Thought and Culture 1
Arts 221R Chinese Thought and Culture 2
Arts 241R Art & Society 1
Arts 242R Art & Society 2
Arts 320R/321R Special Topics in Chinese Thought and Culture

English
Engl 129R Introduction to Written English
Engl 140R/141R The Use of English, 1 and 2
Engl 205R The Canadian Short Story
Engl 240R Form and Function 1
Engl 241R Form and Function 2
Engl 376R/377R Our Changing Language: Syntax and Semantics, 1 and 2
Engl 386R Twentieth Century Literature 1
Engl 387R Twentieth Century Literature 2

Geography
Geog 125R Introduction to the Third World
Geog 126R Development in the Third World
Geog 225R Urbanization in the Third World
Geog 226R Food and Agriculture and Integrated Rural Development in the Third World
Geog 325R Special Topics in the Study of Third World Development

History
Hist 101R/102R Major Themes of Western Civilization, 1 and 2
Hist 364R The Enlightenment 1, Europe in Ferment
Hist 365R The Enlightenment 2, Europe in the 18th Century
Hist 388R History of Modern Revolutions 1
Hist 389R History of Modern Revolutions 2

Religious Studies
RS 100C Religious Quests
RS 100D Religious Movements
RS 231A The Evolution of Christian Thought 1
RS 231B The Evolution of Christian Thought 2
RS 260 Issues in Science, Technology and Religion
RS 262/263 Religion and Politics 1 and 2
RS 266/267 Religion and the Film, 1 and 2
RS 268A Religious Perspectives in Contemporary Literature
RS 268B Religious Perspectives in Contemporary Canadian Literature
RS 360/361 Sacred and Profane in the Arts, 1 and 2
RS 398/399 Directed Readings in Special Subjects
RS 460-463 Special Topics in Religion and Culture

Fine Arts
Fine 246R/247R Religion and the Film, 1 and 2
Fine 248R Film as Social Criticism
Department of Sociology

Associate Professor, Chairman
A. A. Hunter, BA, (Br. Col.), MA, PhD (Wisconsin)

Professors
L. A. Costa-Pinto, BA, Lic, Doctor in Sociology
(Federal University of Brazil)
H. J. Fallding, BA, BSc, MA (Sydney), PhD (Australian National), FRSC
H. D. Kirk, BS (City College, N.Y.), MA, PhD (Cornell)
D. Kubat, MA (Kansas), PhD (L. Maximillian, Munich)

Associate Professors
J. Curtis, BA (Sir G. Wms.), MA (Central Michigan), MA (Cornell)
F. A. Fasick, BA (Penn. State), MA, PhD (Columbia)
R. D. Lambert, BA, MA (McMaster), PhD (Michigan)
W. G. Scott, BA (W. Ont.), MA (Toronto)
E. W. Vaz, BA, MA (McGill), PhD (Indiana)
K. Westhues, BA (Conception), MA, PhD (Vanderbilt)
A. Wipper, BA, MA (McGill), PhD (California, Berkeley)

Assistant Professors
J. Goyder, BA (Bishop's), MA, PhD (McMaster)
S. A. McDaniel, BA (Massachusetts), MA (Cornell), PhD (Alberta)
R. C. Prus, BA (Manitoba), MA, PhD (Iowa)

Associated Faculty

Professors
G. L. DeGré, BSS (City College, N.Y.), MA, PhD (Columbia), Cated Hon (San Marcos, Lima)
G. S. Kenyon, BPhysEd (Br.Col.), MS (Indiana), PhD (NYU), Kinesiology
C. Redekop, BA (Goshen), MA (Minnesota), PhD (Chicago) Conrad Grebel College
D. Smucker, BA (Bluffton), BD (Princeton), MA, PhD (Chicago), Social Sciences, Conrad Grebel College

Associate Professors
G. M. Anderson, BA, MA (McMaster), PhD (Toronto), Sociology and Anthropology, Wilfrid Laurier, Adjunct
B. McPherson, BA, MA (W. Ont.), PhD (Wisconsin), Kinesiology
M. I. Nagler, BA (Br. Col.), MA (Chicago), PhD (Stirling) Renison College
M. Shimpo, BA (International Christian, Japan), MA, PhD (Br. Col.), St. Jerome's College
J. Zuzanek, MA (Moscow State Univ.), CSc, PhD (Charles Univ. Prague), Recreation

Course Descriptions

Sociology

Assistant Professors
F. Desroches, BA (Waterloo), MA (Toronto), PhD (Waterloo), St. Jerome's College
N. Theberge, BA (Massachusetts), MA (Boston), PhD (Massachusetts), Kinesiology

Course Descriptions

Soc 101 S,F,W 2C 0.5
Introduction to Sociology
An introduction to the basic concepts and frames of reference of sociological investigation and interpretation. Topics for analysis will include communities, associations and institutions, classes and status groups, crowds and publics, social processes, and social change. Special attention is given to Canadian society.

Not open to students who have taken Soc 101 (t), 101 (m), or 101 (u). 101 (m) is an introductory course intended as an elective for mathematics students or as a basis for a combined honours in Mathematics and Sociology. 101 (u) is especially designed for Planning students.

Also offered at Conrad Grebel, Renison and St. Jerome's Colleges

Soc 102 S,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 emotional disturbance, poverty, delinquency and industrial disruptions in Canadian society.

Also offered at Renison College

Soc 103 S,F,W 2C 0.5
Canadian Society
An introductory survey of Canadian society. This course will examine issues in the socio-historical development of Canadian society, its present social structure, organizations and ideologies.

Soc 104 S,F,W 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.
Sociology

Soc 105 S,F,W 2C 0.5
Perennial Themes in Social Thought
Both classical and recent social theorists are shown to exhibit common preoccupations, e.g. the relation of the individual to society, the foundations of government, survival through productivity and adaptation, society's location in nature and the cosmos.

Soc 106 S,F,W 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.

Soc 107 S,F,W 2C 0.5
Social Structure and Character
This course will examine the connections between organized social life and types of personalities found in it. Examples will be drawn from contemporary as well as historical situations.

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 F,W 2C 0.5
Sociology of Adolescence
The social definitions of adolescence in cross-cultural and historical perspective. Social roles of adolescence 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 F,W 2C 0.5
Sex 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

Course Descriptions
Sociology

Soc 209 F,W 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

Soc 214 F,W 2C 0.5
Social Inequality
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 222 F,W 2C 0.5
Juvenile Delinquency
A systematic analysis and criticism is presented of biological, psychological, psychoanalytical and sociological theories of juvenile delinquency. Attention is given to statistics and contemporary research with special emphasis on the distribution and types of delinquent subcultures.
Prereq: Soc 101 or consent of instructor

Soc 223 F,W 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 persons become involved in deviant activities, and the contingencies affecting persons' careers as deviants.
Prereq: Soc 101 or consent of instructor

Soc 224 W 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 227 F,W 2C 0.5
Crime and Society
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 statistics and contemporary research. Special attention is given to Canadian data.
Prereq: Soc 101 or consent of instructor
Soc 233 F,W 2C 0.5
Social Psychology of Beliefs and Attitudes
Examines the nature of social beliefs and attitudes toward various groups in society, such as ethnic, political and religious groups. Considers the sources, organization and distribution of beliefs and attitudes, and their implications for Canadian society.
Prereq: Soc 101 or Psych 101 or consent of instructor

Soc 235 F,W 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 F,W 2C 0.5
Social Movements
The sociological analysis of varieties of social movements and their relationships to social organization and social change.
Prereq: Soc 101 or consent of instructor

Soc 242 F,W 2C 0.5
Industrial Sociology
Special emphasis is given in lectures, readings 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 F,W 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 F,W 2C 0.5
Sociology of Death and Dying
The course deals with the current literature on death and dying; also, with the sociological implications of institutional housing of the terminal patients. 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 F,W 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 253 F,W 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. Emphasis on immigration and immigration policy.
Prereq: Soc 101 or consent of instructor

Soc 254 F,W 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 255 F,W 2C 0.5
Third World Development
An analysis of issues of social and economic development in selected areas of the Third World, including Africa, Asia, and Latin America.
Prereq: Soc 101 or consent of instructor

Soc 256 F,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
Also offered at St. Jerome's College

Soc 264 F,W 2C 0.5
Sociology of Religion
Religion is defined broadly and its relation to phenomena like totalitarian movements, psychoanalysis and drug experience examined. The features common to all religions are explained, viz. myth, dogma, church, ritual, ethics, and religious experience.
Prereq: Soc 101 or consent of instructor
Also offered at St. Jerome's College

Soc 265 F,W 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
Sociology of Militarism
A sociological approach to the role of the military corporation in different structural and historical contexts. Topics include the professionalization of the military, the development of military technology and its implications for national and international society.
Prereq: Soc 101 or consent of instructor

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

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

Social Statistics and Social Indicators
A first course in sociological statistics, sampling, central tendency, probability, covariance, as illustrated in specifically sociological data.
Prereq: Soc 101 or consent of instructor

Methods I
A systematic treatment of the logic and practice of methods basic to social research. Emphasis is on problems of research design based on the analysis of case studies.
Prereq: Soc 101 or equivalent

Methods II
Continuation of Research Methods I. Includes an introduction to sampling, scaling, the analysis of change, and experimental design. Students will be asked to construct a research design for the study of a theoretically relevant problem in sociology.
Prereq: Soc 281

Comparative Sociology of Youth
The aim of this course is mainly to study the prevailing patterns and resulting problems connected with the ways in which different societies react to the emergence of new generations. Concentrates on an analysis of the 1960s.
Prereq: Soc 101 and one other Sociology course

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 one Sociology course in the 220 series

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

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

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 and Soc 248

Aging, the Aged and Leisure: A Sociological and Social Psychological Perspective
Employing a sociological and psychological frame of reference, the process and problems of aging are analyzed. Special emphasis will be given to the problems of leisure time in the later years of life.
(Same as Kin 352 and Rec 361).
Prereq: Soc 101 and one other Sociology course

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.
(Same as Rec 301).
Prereq: Two term courses in sociology
Soc 348 W,S 3C 0.5  
**Sport in Society**  
An introduction to the sociology of sport. Utilizing the major frames of reference of the social sciences, the function of sport in contemporary society is examined.  
*(Same as Rec 303 and Kin 252).*  
**Prereq:** Soc 101 and one other Sociology course.

Soc 354 F,W 2C 0.5  
**World Population Problems**  
Comparative Analysis of population problems across societies. Focus is on social institutions and their relationships to population. Emphasis on fertility and family planning.  
**Prereq:** Soc 101 and Soc 253.

Soc 364 F,W 2C 0.5  
**Social Change**  
A systematic review and analysis of sources, patterns, processes, and consequences of social change. Special topics include: Marxism, social change in developing countries, the role of ideas, and the breakdown and reorganization of social structure.  
**Prereq:** Soc 101 and one other Sociology course. Also offered at St. Jerome’s College.

Soc 366 F,W 2C 0.5  
**Urban Sociology**  
The comparative study of urbanization as a process; the culture and organization of cities, urban problems; special attention is given to industrial cities of Canada, with comparative reference to the principal cities of Western societies.  
**Prereq:** Soc 101 and one other Sociology course.

Soc 371 3C 0.5  
**Philosophy of Social Science**  
Problems about the fundamental methods and aims of the social sciences generally, the problems specific to Psychology, Sociology, Political Science, etc., and their relations to one another will be considered.  
*(Same as Phil 362)*  
**Prereq:** Some previous work in a Social Science or in Philosophy.

Soc 380 F,W 2C 0.5  
**Qualitative Methods: Field Techniques**  
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 and one other Sociology course.

Soc 381 F,W 2C 0.5  
**Quantitative Methods**  
Design and data analysis in contemporary sociological research, with an emphasis on the analysis of secondary data and computer applications.  
**Prereq:** Soc 101 and Soc 280.

Soc 405 F,W 2C 0.5  
**The Development of Sociological Theory**  
Development of sociological theory in the 19th and early 20th centuries. Emphasis is on the European tradition, although selective attention is given to North American theorists.  
**Prereq:** Soc 101 and one other Sociology course (Soc 271 is recommended).

Soc 406 F,W 2C 0.5  
**Contemporary Sociological Theory**  
Development of sociological theory in the 20th century. Included is discussion of current theoretical work.  
**Prereq:** Soc 101 and one other Sociology course (Soc 271 is recommended).

Soc 404A,B,C,D,E,H,K,M,N,P,S,X S,F,W 0.5  
**Directed Readings**  
Selected readings and essay assignments under the direction of a faculty member.  
**Prereq:** Fourth year standing in Sociology.

Soc 440A F,W 0.5  
**Directed Readings in Deviance, Criminology, and Corrections**  
Instructors: Prus, Vaz, Wipper and others.

Soc 440B F,W 0.5  
**Directed Readings in Social Psychology**  
Instructors: Lambert, Prus, and others.

Soc 440C F,W 0.5  
**Directed Readings in Social Inequality**  
Instructors: Costa-Pinto, Curtis, Goyder, Hunter, and others.

Soc 440D F,W 0.5  
**Directed Readings in Quantitative Methods and Statistics**  
Instructors: Goyder, Hunter, McDaniel and others.

Soc 440E F,W 0.5  
**Directed Readings in Social Theory**  
Instructors: Costa-Pinto, DeGré, Fallding, and others.

Soc 440H F,W 0.5  
**Directed Readings in the Family**  
Instructors: Fallding, Fasick, Kirk, and others.
Course Descriptions
Sociology

Soc 440K  F,W  0.5
Directed Readings in Industry, Work and Complex Organizations
Instructors: Scott, Wipper, and others.

Soc 440M  F,W  0.5
Directed Readings in Religion
Instructors: Faliding, Westhues, and others.

Soc 440N  F,W  0.5
Directed Readings in Demography
Instructors: Kubat, McDaniel, and others.

Soc 440S  F,W  0.5
Directed Readings in Developing Nations
Instructors: Costa-Pinto, Wipper, and others.

Soc 440V  F,W  0.5
Directed Readings in Sex Roles
Instructors: McDaniel and others.

Soc 440X  F,W  0.5
Directed Readings in Medical Sociology
Instructors: McDaniel and others.

Soc 499  Y  1.0
Senior Honours Essay
Required of all honours students in Sociology or by election by joint honours students in their fourth year. For students electing Honours Sociology (Canadian Studies), the essay should bear on some topic of particular sociological significance for Canadian society.
Prereq: Fourth year Sociology Honours.

Conrad Grebel College

Soc 190G Sociology of Dissent
Not offered 1981-82.

Soc 20/G Sociology of Education
Not offered 1981-82.

Soc 220G  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.

Soc 225G  W  3C  0.5
Sociology of Sects and Cults
A sociological analysis of religious groups and movements considered deviant by the dominant societies.

Soc 275G  F,S  3C  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.

Soc 286G Sociology of Ecology
Not offered 1981-82.

Soc 290G  W  3C  0.5
Utopian Communities Past and Present
An examination of intentional communities, extinct and contemporary. Attention will be paid to origin, purpose, structure and process in each community studied. An assessment of factors contributing to success and failure will be attempted.
Prereq: An introductory social science course.

Soc 307G Problems in Contemporary Education
Not offered 1981-82.

Soc 326G Issues in Third-World Development
Not offered 1981-82.

Soc 370G  F  3C  0.5
Sociology of Law
Special attention will be paid to the growing public awareness of the failure of law to provide justice or social control in a growing 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 in a social science course or by permission.
Offered at St. Jerome's College

Soc 377G  0.5
Studies in the Sociology of the Mennonites
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.
St. Jerome's College

The following courses are administered by St. Jerome's College

Soc 206J W 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.

Soc 219J W 3C 0.5
**Catholic Sociological Thought**
An analysis of the distinctive emphases 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 249J W 3C 0.5
**Sociology of Mental Illness**
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, after-care and rehabilitation, and the epidemiology of mental illness will be examined.
*Prereq: Sociology 101 or permission of the instructor.*

Soc 349J Mental Illness in the Family
*Not offered 1981-82.*

**Note**
For other Sociology courses offered at Renison College, please see course descriptions for Social Development Studies.

Course Descriptions

**Sociology**

**Spanish**

Department of Spanish

Assistant Professor and Chairman of the Department
B. Thalman, BA (DePauw), MA, PhD (Ohio State)

**Professor**
J. C. McKegney, BA (W. Ont.), MA (Oregon),
PhD (Washington), Diploma (Santander)

**Associate Professor**
C. M. Fernández, Lic en Arq (Madrid), MA (Tulane),
D Lit et Phil Universitas Complutensis (Madrid)

Lecturer
L. Bigford, BA, MA (Toronto)

Adjunct Faculty at Wilfrid Laurier University

**Professors**
N. H. Tayler, President of Wilfrid Laurier, BA, MA,
PhD (Toronto)
A. A. Borrás, BA (Kentucky), MA (Indiana),
PhD (Pennsylvania State)

**Associate Professor**
J. V. Solanas, MA, PhD (Valencia)

**Professor Emeritus**
T. Laurence Dawson, BA, MA, PhD (Toronto)

Span 101 F,W,S 3C,1L 0.5
**Introduction to Spanish I**
For students with no previous knowledge of Spanish. 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.
*(WLU 101/151-40)*
Cannot be taken concurrently with Span 111.

Span 102 F,W,S 3C,1L 0.5
**Introduction to Spanish II**
A continuation of Spanish 101.
*Prereq: Span 101 or consent of Department.*
*(WLU 102/152-04)*

Span 111 F 3D,1L 0.5
**Conversational Spanish**
Intensive oral and aural training with particular emphasis on comprehension and speaking. Intended for students with no knowledge of Spanish. Limited to a maximum of 20 students.
*(WLU 111/161-40)*
Cannot be taken concurrently with Span 101.
Span 201A  F  3C,1L  0.5
_Intermediate Spanish I_
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 101/102 or Grade 13 Spanish. (WLU 121/171-30)

Span 201B  W  3C,1L  0.5
_Intermediate Spanish II_
A continuation of Spanish 201A. **Prereq:** Span 201A or consent of Department (WLU 122/172-03)

Span 203  F  3C,D  0.5
_Spanish Civilization I_
Development of Spanish Civilization and culture from the earliest times to the present. This course will be taught in English. (WLU 203/253-30)

Span 204  W  3C,D  0.5
_Spanish Civilization II_
A continuation of Spanish 203.

Span 205  F  3C  0.5
_Survey of Spanish Literature I_
Readings of major authors and study of the main literary trends from the middle ages to the eighteenth century. **Prereq:** Span 102 or 201A/201B (WLU 205/255-30)

Span 206  W  3C  0.5
_Survey of Spanish Literature II_
A continuation of Span 205 from the eighteenth century to the present. **Prereq:** Span 205. (WLU 206/256-03)

Span 207  F  3C,D  0.5
_Spanish American Civilization I_
A survey in English of the history of the former Spanish possessions in American, from the earliest times to the present, with emphasis on pre-Columbian cultures in Mexico and the Andean area. Several lectures on the role of women in Spanish America. No knowledge of Spanish required. (WLU 223/273-30)

Span 208  W  3C,D  0.5
_Spanish American Civilization II_
A survey in English of the art, literature and music of Spanish America, with emphasis on pre-Columbian and modern Mexican art. No knowledge of Spanish required. (WLU 235/283-03)

Span 227  F  3C,D  0.5
_Survey of Spanish American Literature I_
A survey of literary trends and most significant works from the Conquest to the nineteenth century. **Prereq:** Span 102 or 201A/201B. (WLU 208/258-30)

Span 228  W  3C,D  0.5
_Survey of Spanish American Literature II_
A continuation of Span 227. **Prereq:** Span 227. (WLU 209/259-03)

Span 251A  F  3C,D  0.5
_Composition and Conversation I_
Intensive language study based on literary texts, including vocabulary, grammar and syntax. Essay writing, speeches, discussion. **Prereq:** Span 201A/201B or consent of the Department. (WLU 211/261-30)

Span 251B  W  3C,D  0.5
_Composition and Conversation II_
A continuation of Span 251A. **Prereq:** Span 251A (WLU 212/262-03)

Span 265  F  3C,D  0.5
_The Spanish Short Story_
Selected stories from outstanding writers in Spain, primarily of the twentieth century. **Prereq:** Span 201A/201B. (WLU 204/254-30)

Span 266  W  3C,D  0.5
_The Spanish American Short Story_
Selected stories from outstanding writers in Spanish America of the nineteenth and twentieth centuries. **Prereq:** Span 201A/201B. (WLU 214/264-03)

Span 304  F  2C  0.5
_Romanticism in Spain_
Drama: preliminary study of Moratin’s Neo-Classical drama. Readings of selected plays by Duque de Rivas, Juan Eugenio Hartzenbusch, García Gutiérrez and José Zorrilla. Poetry: The search for selfhood in the romantic man, as expressed in the poems of Gustavo Adolfo Bécquer, Rosalia de Castro and other poets. **Prereq:** Span 206. (WLU 304/354-20)
Span 305 W 2C 0.5
The Spanish Realist Novel
Study of the fundamental narrative techniques and ideology in some of the most representative novels of Emilia Pardo Bazán, Benito Pérez Galdós, and Vicente Blasco Ibáñez. Other realist novelists will also be discussed within the context of European positivism and the psychological schools of the period.
No prerequisite
(WLU 305/355-02)

Span 311 F,W 2C 0.5
Applied Spanish Stylistics
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 324 F 2C 0.5
Contemporary Spanish Theatre and Poetry
An in-depth analysis of the works of López-Rubio, Casona, Mihura, J. R. Jiménez, Salinas, D. Alonso, Aleixandre, et al, with emphasis on the works of Buero, Sastre and García Lorca.
Prereq: Span 206.
(WLU 324/474-20)

Span 325 W 2C 0.5
Contemporary Spanish Novel
Influences on the novel and literary tendencies, with stress on Cela, Matute, Laforet, Angel de Lera and Carlos Rojas.
Prereq: Span 206.
(WLU 325/473-03)

Span 328 F 2C 0.5
The Spanish Golden Age: Theatre & Poetry
A study of one verse drama each of Lope de Vega, Tirso de Molina, and Calderón de la Barca; also outstanding sonnets of the period by Garcilaso, Herrera, Gongora, Lope and Quevedo.
Prereq: Span 206.
(WLU 328/476-20)

Span 327 W 2C 0.5
The Spanish Golden Age: Don Quijote
A literary analysis of Don Quijote.
Prereq: Span 206.
(WLU 327/477-02)

Span 331 F 2C 0.5
Contemporary Spanish Essay
An overview of the historical essay in Spain: Gavinet, Maragal, Maetz, Pidal, D'Ors, with special consideration of Madariaga, Unamuno and Ortega.
Prereq: Span 206.
(WLU 316/466-02)

Span 333 W 2C 0.5
Modern Spanish American Poetry
A study in depth of major poets and movements since Modernism.
Prereq: Span 227. (Offered in alternate years)
(WLU 319/469-20)

Span 334 W 2C 0.5
Modern Spanish American Prose
A critical study of masterpieces in prose from Sarmiento to the present.
Prereq: Span 227. (Offered in alternate years)
(WLU 308/358-20)

Span 344 F,W 2T 0.5
Special Topics in Hispanic Studies
By special arrangements, an individual student or a small group of students will follow a course of study under the supervision of a faculty member.
(WLU 317/467-20)

Span 351A F 2C,D 0.5
Advanced Composition and Conversation I
Writing of essays and discussion based on selected themes or topics relating to Spain or Spanish America.
Prereq: Span 251A/251B.
(WLU 301/351-22)

Span 351B W 2C,D 0.5
Advanced Composition and Conversation II
A continuation of Span 351A.
Prereq: Span 351A.
(WLU 302/352-20)

Span 354 F 2C,D 0.5
The Spanish American Essay
A study in depth of Spanish American thinkers from Sarmiento to the present.
Corequisite: Span 227. (Offered in alternate years)
(WLU 306/356-02)

Span 388 F 2C,D 0.5
Aspects of Contemporary Spanish American Theatre
A study of the most important dramatists of continental Spanish America and the Spanish-speaking Caribbean.
Corequisite: Span 227. (Offered in alternate years)
(WLU 309/359-20)
Core Course Descriptions

Arts 202P 0.5
**Psychology of Religion in Historical Perspective**
A study of 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.

RS 270 0.5
**Psychology of Religion**
A study of theories of the psychological nature of religious experience, the sources of religious belief and religious significance of psychological phenomena. Topics include faith, doubt, evangelism, conversion, faith healing and mysticism, drugs and religious experience, tongue-speaking.

RS 271 0.5
**Personality and Religion**
A study of the psychology of personality in its relationship between personality and religious thought, experience and behaviour.

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 (0.5) Religious Approaches to Personal Crisis
R S 275 (0.5) Religion and Psychotherapy
R S 370 (0.5) Dream in the Religious Experience of Mankind
R S 371 (0.5) Religion and Self-Destructive Behaviour

Psychology
Psych 101 (0.5) Introductory Psychology
Psych 211 (0.5) Developmental Psychology
Psych 214 (0.5) Psychology of Adolescence
Psych 218 (0.5) Aging, Dying and Death
Psych 231 (0.5) Psychology of Religious Experience
Psych 254 (0.5) Interpersonal Relations
Psych 258 (0.5) Principles and Evolution of Psychoanalytic Thought
Psych 334 (0.5) Theories in Counselling Psychology
Psych 355 (0.5) Personality Theory
Psych 357 (0.5) Psychopathology

Philosophy
Phil 111 (0.5) Philosophy of Life
Phil 135 (0.5) Introduction to Philosophy of Religion
Phil 201 (0.5) Love
Phil 203 (0.5) Philosophical Perspectives on Death
Phil 235 (0.5) Philosophy and Mysticism
Phil 236 (0.5) Philosophy of Religion: The Occult
Phil 470 (0.5) Phenomenology

Sociology
Soc 101 (0.5) Introduction to Sociology
Soc 102 (0.5) Social Problems
Soc 105 (0.5) Perennial Themes in Social Thought
Soc 233 (0.5) Social Psychology of Beliefs and Attitudes
Soc 247 (0.5) Sociology of Death and Dying
Soc 206 (0.5) Sociology of Sex Roles
Soc 209 (0.5) Family and Kinship
Soc 264 (0.5) Sociology of Religion

Social Development Studies
Soc 220R (0.5) The Individual, Society and Religion
Systems Design Course Numbering

The numbering of Systems Design 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 programme in which the student will encounter the course.

The majority of Systems Design courses are given on the basis of three formal lectures and one tutorial hour each week. The department endeavours 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.

Course Descriptions

Sy De 101/102  F,S  1C  0.0
Tutorial
Systems Design first 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 111  F  3C,1T  0.5
Calculus 1

Sy De 112  S  3C,1T  0.5
Calculus 2
Techniques of systematic integration, applications of integration. Sequences, series, infinite series, power series, with applications.

Sy De 113  F  3C,1T  0.5
Linear Algebra

Sy De 114  S  3C,1T  0.5
Theory and Applications of Probability

Sy De 121  F  3C,1T  0.5
Digital Computation
Introduction to electronic digital computers; hardware and software organization, basic features of Fortran, examples of efficient algorithms for engineering computations.

Sy De 122  S  3C,1T  0.5
Introduction to Computer Systems
Machine architecture and software for small computers; operating systems; machine and assembly language programming using cross assemblers and microcomputers; interfacing with peripheral equipment; current engineering applications of micro and mini-computers.

Sy De 131  F  2C,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, perception, human information processing; motor function; human work, skill, fatigue; problems of acoustic noise, vibration, heat, cold; needs of ventilation and lighting.
Introduction to Systems Design 1
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.

Introduction to Systems Design 2
A continuation of Sy De 161 with emphasis on need analysis and problem definition. Techniques of surveying, market analysis. Generation of design criteria and introduction to decision analysis. A number of open ended problems taken to the stage of solution specification.

Statics
Statics of particles, vectors, equilibrium of rigid bodies, centroids, the analysis of structures, forces in beams and cables, friction and moments of inertia.

Dynamics
Rectilinear motion, plane motion, dynamics of particles, work and energy, linear momentum, rotational motion, angular momentum, harmonic motion, gravitational, wave motion.

Systems Design Workshop 1
Systems Design second year students will meet a faculty member designated as their class professor. Performance in assignments, conceptual difficulties with courses, inter-relation of coursework, later work and engineering practice will be discussed. Non-credit courses.

Applicable Mathematics for Systems Design 1

Applicable Mathematics for Systems Design 2

Theory and Applications of Statistics

Physical Systems 1
Component models, interconnection models, systems equations and their rank properties and solutions. These concepts are developed with respect to electrical systems.

Systems Design Workshop 2
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.

Mechanics of Deformable Solids

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.

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.


**Course Descriptions**

**Systems Design Engineering**

**Sy De 284** F 3C,1T 0.5

**Fluid Mechanics**

**Sy De 292** F 1C,3L 0.5

**Systems Design Laboratory 1**
Digital logic with emphasis on the use and characteristics of integrated circuits; design of sub-systems and systems using digital 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 2C,1T 0.5

**Systems Operations 1**
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 322** W 3C,1T 0.5

**Computer Simulation of Systems**
System modelling, system simulation techniques digital computer methods, fundamentals of analog computation, digital simulation of analog computers; block-oriented languages, introduction to systems simulation using hybrid computers.

**Sy De 332** W 2C,1T 0.5

**Mathematical Programming**
Theory and application of linear programming, techniques; simplex, the transportation and assignment problems, duality and degeneracy. Industrial applications to production and inventory control. Selected problems from nonlinear and dynamic programming.

**Sy De 333** S 2C,1T 0.5

**Experimental Design**
Analysis of experimental optimum-seeking techniques. Studies include deterministic and stochastic problems. Topics include: single variable search, simultaneous and sequential search, simulations and sequential search, geometry of multidimensional response surfaces and methods of steepest ascent; regression analysis.

**Sy De 341** S 2C,1T 0.5

**Industrial Ergonomics**
Man-machine function and human reliability; human stress and adaptation; work and skill in industry and the operational environment; human factors in industrial safety and occupational hygiene.

**Sy De 351** S 3C,1T 0.5

**Physical Systems 2**
The subject matter is similar to Sy De 252 in that the development is based on other physical systems such as mechanical and hydraulic systems.

**Sy De 352** W 2C,1T 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 programmes for system analysis.

**Sy De 354** W 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 361** S 1C,3L 0.75

**Systems Design Workshop 3**

**Sy De 362** W 1C,3L 0.75

**Systems Design Workshop 4**
A continuation of the Systems Design Workshop sequence for third year students.

**Sy De 364** W 3C,1T 0.5

**Manufacturing Science**
Course Descriptions
Systems Design Engineering

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 an information processing problem; recognition and classification of patterns in data; distinguishing features. Probability and statistics, linear algebra, and calculus are combined with concepts from communication theory and information science to develop techniques of data analysis. Examples include: optical character recognition, automated cytology, disease diagnosis, earthquake prediction, meteorology, aerial photograph analysis, personal credit rating, economic forecasting.

Sy De 381 S 3C,1T,2L 0.5
Materials Engineering
A general introduction to the science of materials. To demonstrate some of the important relationships existing between the structure of a material and its properties, and to consider some of the ways in which materials are shaped, formed and fabricated into articles for everyday use.

Sy De 383 S 2C,1T 0.5
Introduction to Biochemical and Polymer Systems
An introduction to the chemistry of amino acids, peptides, proteins, nucleic acids, carbohydrates and lipids. An introduction to polymer chemistry, isomerism, chain-growth polymerization and copolymerization, ionic polymerization.

Sy De 391 S 1C,3L 0.5
Systems Design Laboratory 2
Introduction to electronic filters, attenuation, amplification oscillation, modulation and detection; application to instrumentation.

Sy De 392 W 1C,3L 0.5
Systems Design Laboratory 3
This course serves as a focus for the complete lab programme sequence. The emphasis is on the design of major experiments which are themselves complete systems requiring the application of previous acquired knowledge in the areas of sensing, synthesis, control, measurement and evaluation. At least one experiment will be drawn from the digital control or computer control environment and one 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 2C,1T 0.5
Systems Operations 2
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 2C,1T 0.5
Linear Graph Theory and Applications
The application of graph theory to engineering problems. The emphasis is on solution techniques that require the use of linear graphs. Typical problem areas include commodity distribution networks, topological aspects of electronic circuits, fault diagnosis, information retrieval, etc. Specific graph-theoretic ideas are developed in terms of the problems and their solutions.

Sy De 421 F 3C,1T 0.5
Computer Aided Design 1
The design process; computer-oriented system models; simulation languages for continuous and discrete systems; man-machine interaction; design of problem-oriented computer languages.

Sy De 432 W 2C,1T 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 2C,1T 0.5
Conflict Analysis
The application of non-quadratic game theory to the analysis of conflict, particularly conflicts arising in the implementation of design projects. The general characteristics, (through Metagame theory) and specific applied techniques for analyzing conflicts between parties each with separate objectives.
Planning of Facilities

Occupational and Environmental Systems Safety
Historical developments of occupational safety and safety legislation. Master and servant relationships, assumption of risk, product liability, etc. Concept of system safety and safety as a system component in design and industry.

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.

Measurement Methods in Human Engineering
Requirements of human measurement and its role in design. Techniques of environmental measurement with respect to noise, vibration, heat, lighting, air sampling, etc., and selected studies in the methods of anthropometry.

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 analogue methods for solution.

Topics in Physical Systems Theory
This course investigates the concepts and techniques used in hydraulic, power, communication and control systems. Established classical methods of analysis will be compared with recent graph-theoretic methods.

Large Scale Engineering Systems
The course brings materials from the core Systems Design curriculum to bear upon the analysis of large engineering systems; examples from a variety of engineering disciplines such as energy systems, economics, transportation, hydraulics, mechanical, electrical, and structural systems and their combinations; techniques for the analysis of complex systems using digital computers.

Systems Design Workshop 5
A continuation of the Systems Design Workshop sequence for fourth year students.

Economics of Technological Development and Design
Economic factors associated with technological design, development and innovation. Approaches to analyzing and predictively modelling technological situations under conditions of change and uncertainty.

Structures and Design
Structural forms. Structural requirements. Statistically determinate and indeterminate structures. Basic theorems of linear elastic structures. Methods of analysis: slope-deflection, moment distribution, etc. Application of Graph Theory to the analysis of structural systems.

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.

Computer-Aided Simulation and Design
System modelling and simulation techniques, fundamentals of analogue computation, time and magnitude scaling; continuous system simulation on the digital computer; advantages and disadvantages of digital and analogue simulation techniques; discrete-event system simulation on the digital computer; system simulation; examples and problems.
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 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.

Human Engineering
Man-machine systems; man-machine interface; presentation of information; design of displays and controls; workplace layout; human factors in design.

Ergonomics
Significance of ergonomics; man-machine-environment complex; physiology of work, fatigue, and boredom; environmental factors in industry (noise, vibration, vision, illumination, heat, cold, toxic chemicals, radiation); industrial and automotive safety.

Introduction to Physical Systems
This course introduces students to a unified approach to Physical System Theory, using a graph-theoretical modelling technique. Specific topics include: component modelling, the system graph and its matrices, system modelling by the branch, chord and branch-chord methods, power, energy, Tellegen's theorem, multi-terminal representations, piecewise analysis of systems through subsystems, multiport representations, formulation and solutions of state models, introduction to advanced topics.

Design Morphology and Organization
Generation of problem statements, system identification, generation of solution sets, feasibility determination. Construction of archetypes; sensitivity, compatibility and stability analysis; behaviour prediction and solution communication.

Introduction to Systems Behaviour
The basic aim of this course is to introduce the student to the study and understanding of systems and their general behaviour, to broaden systems concepts and the techniques used in applying these concepts in a variety of fields. The fields chosen cover biological, ecological, social, operational, economic and man-machine systems. A number of case studies are conducted.
Course Descriptions
Urban and Regional Planning

Associate Professors
S. Herzog, BArch (Toronto), MRAIC
J. T. Horton, BA (Wheaton), MA (Northwestern)
J. Levy, BA (Waterloo), BPE (Waterloo), MSW (Waterloo), PhD (Waterloo)
L. R. G. Martin, BA (Queen's), MA, MRP, PhD (Syracuse) MCIP
A. G. McLellan, BSc, PhD (Glasgow)
N. E. P. Procean, BArch (McGill), MArch, urb des (Cornell), Cert USP (Manchester), MCIP, AICP, AIU
G. B. Priddle, BA (Waterloo), MA, PhD (Clark)
(on Sabbatical Leave 1981-82)
S. G. Rich, MCIP, MRAIC, ARIBA, AICP
D. F. Walker, BSc (London), MA, PhD (Toronto)
S. M. Weaver, BA, MA, PhD (Toronto)
D. H. Wood, BComm, LLB (Toronto)

Assistant Professors
E. Baxter, BA, MA (Br. Col.), PhD (Oregon)
N. M. Lazarowich, BA (Sask.), MA, MCP, PhD (Cincinnati), AICP
R. C. Suffling, BSc Hons (Wales), PhD (Guelph)

Adjunct Professors
H. C. Abell, BHSc (Toronto), MS, PhD (Cornell)
A. deVos, MSc, PhD (Wisconsin)
M. K. Foster, BA (Toronto), MPhil, PhD (Columbia)
J. C. Lord, BEd, BPE (McGill), MPE, PhD (Springfield Coll.)
N. F. White, BSc (Queens), MDCM (McGill)
J. S. Wolfe, BA (Oxford), MA (Pittsburgh), PhD (McMaster)

Professional Liaison Officer
H. T. Lemon, FCIP

Planning Graphics Technician
K. Bowles, BLA (Guelph)

Faculty members holding joint and/or cross appointments as shown

*Planning and Biology
*Planning and Geography
*Environmental Studies
*Planning and Man-Environment Studies
*Planning and Anthropology
*Planning and Recreation
*Planning and Environmental Studies
*Environmental Studies and Psychology

Course Descriptions

Plan 100 Y 3C, 1D 1.0
Introduction to Urban and Regional Planning Concepts and Techniques
An introduction to the regional city, 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. Particular attention is directed to methodological aspects of designing a planning programme: identification of objectives and constraints, conduct of basic surveys and analysis, plans and policies preparation, evaluation and implementation.
Prereq: Planning students only

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 1st and 2nd year students in other programs.

Plan 159 F,W 2std 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 cost to student: $30

Env S 111 Introduction to the Study of the Future
See Env S course descriptions, page 000.

Env S 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 1st and 2nd year students in other programs.

Env S 159 F,W 2std 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 cost to student: $30

Env S 195A Introduction to Environmental Studies
See Env S course descriptions, page 322.

Env S 195B Introduction to Environmental Problems
See Env S course descriptions, page 322.

Env S 200 Field Ecology
See Env S course descriptions, page 322.

Env S 201 Introduction to Environmental and Planning Law
See Env S course description, page 322.
Course Descriptions
Urban and Regional Planning

Env S 202 Social Science Approaches to Environmental Problems
See Env S course descriptions, page 322.

Plan 222 W 2C,1D 0.5
Canadian Regional Issues
Selective study of Canadian development issues pertaining to the use of land, urbanization, regional and resource development; issues will be related to structural and functional forces that are characteristics of the major regions of Canada, e.g., Atlantic Provinces, British Columbia.
Prereq: None

Plan 230 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

Env S 252 Media Tools for Environmental Studies
See Env S course descriptions, page 322.

Env S 253 Media Tools for Environmental Studies - Advanced Level
See Env S course descriptions, page 322.

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 256 Y 2C,2std 1.0
Principles of Environmental Design
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, film and verbal presentations.
Prereq: second year Planning, or Environmental Studies students with consent of instructor

Plan 258 F,W 3S 0.5
Readings and Research in Planning
Special readings and research on planning topics chosen in consultation with an instructor. This course gives the opportunity for supervised individual reading and study of planning or related topics in which the student is particularly interested.
Prereq: Plan 100, or consent of instructor
Prior to registering for this course students must arrange with a faculty member to serve as advisor.

Env S 271 Introduction to Quantitative Research Methods
See Env S course descriptions, page 322.

Env S 272 Computer Programming in Environmental Studies
See Env S course descriptions, page 322.

Plan 300 Y 3wkshp 1.0
Seminar/Workshop Project in Urban and Regional Planning
An integrated approach to the comprehensive analysis and design of communities; identification and synthesis of factors relating to function; structure, environmental context, regional framework etc., in the preparation of comprehensive development programmes. A major project undertaken in small project groups.
Prereq: Third year Planning students only

Plan 301 F,W 3std 0.5
Planning Design
A study of a particular design aspect of planning through a series of individual and group projects. The topic varies each term.
Prereq: Planning students or consent of instructor

Plan 307 F,W 2C,1D 0.5
Social Survey Techniques
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. Cross-listed as Geog 307
Prereq: Second or third year Planning students with Env S 271; other Env S students with consent of instructor.

Env S 310 Behavioural Studies
See Env S course descriptions, page 322.

Plan 316 W 3S 0.5
Multivariate Statistics
The theory and application of multivariate statistics, with particular emphasis upon the use of the computer. Cross-listed as Geog 316.
Prereq: Env S 271, or consent of instructor
Plan 317  W  2C,1L  0.5  
**Nonparametric Statistics**
The theory and application of non-parametric statistics with emphasis upon social science problems. Cross-listed as Geog 317.  
*Prereq: Env S 271, or consent of instructor*

Plan 318  F  3C  0.5  
**Spatial Analysis**
Advanced quantitative analysis of spatial patterns and interactions. Focus on a selection of techniques from gravity models, linear programming, nearest neighbour analysis, Markov chain analysis, graph theory, simulation and trend surface analysis. Cross-listed as Geog 318.  
*Prereq: Env S 271, or consent of instructor*

Plan 319  F  2C,1L  0.5  
**Economic and Social Techniques for Regional Planning**
Study and critical appraisal of a selection of descriptive and evaluative regional analysis techniques in common use. Reliability and applicability will be reviewed. Emphasis given to economic considerations of regional development. Discussion of input-output analysis; cost-benefit analysis, planning, programming and budgeting systems; and social area analysis. Cross-listed as Geog 319.  
*Prereq: Econ 101, 102, or instructor's consent*

Plan 330  W  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 332  W  2C,1S  0.5  
**The Sociology of Rural Development**
Basic concepts of sociology; occupational and concomitant social adjustments of rural society in response to forces of urbanization and industrialization; social movements generated within the farm population. Case studies in Canadian rural development.  
*Prereq: Soc 101, or consent of instructor*

Env S 333  Parkland Management  
*See Env S course descriptions, page 322.*

Plan 333  F  3C  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 358  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, 343, or consent of instructor

Plan 360  F  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. Cross-listed as Civ E 190
Prereq: Plan 256 or consent of instructor

Plan 370  W  3C  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

Env S 380/381
Environmental Studies Workshop
See Env S course descriptions, page 322.

Plan 391  W  Fldlab  0.5
Field Research Methods and Projects
Selected field trip experience directly related to the theme content of Plan 300, including assignments, follow-up discussion, and presentation of research papers. The School covers part of the cost of travel and accommodations for field trips. Approximately $60.00 will cover the remainder of transportation and accommodation costs on a one week field trip. Students are responsible for the cost of their meals.
Prereq: Enrolment in Plan 300

Env S 400 Professional Development in Environmental Management
See Env S course descriptions, page 322.

Env S 401 Environmental Law
See Env S course descriptions, page 322.

Env S 402 Planning Law
See Env S course descriptions, page 322.

Course Descriptions
Urban and Regional Planning

Env S 411 Alternative Future Environments 1
See Env S course descriptions, page 322.

Env S 412
Alternative Future Environments 2
See Env S course descriptions, page 322.

Plan 414  F  3C  0.5
Housing Policies
Focus on Canadian housing policies and programmes, 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 programmes in the United States and developing countries.
Prereq: Plan 256, or consent of instructor

Env S 417 Land Use History and Landscape Change 1
See Env S course descriptions, page 322.

Env S 418 Land Use History and Landscape Change 2
See Env S course descriptions, page 322.

Plan 420  F  2C  0.5
Health, Environment, and Planning
A seminar course on the environmental sources and causes of disease and illness, the concepts of health, e.g. medical, scientific, economic, political, etc., the health services and facilities and related technologies and the role and responsibility of (urban and regional) planners in the creation of a more "healthful" environment.
Prereq: Third and fourth year planning students or consent of instructor

Plan 430  F  3C  0.5
Social Policy Planning
This course develops a reasoned systems approach to understand change and develop strategies for change through an integration of social goals, policy and programmes. Institutional performance criteria are identified in time and space at the level of system, subsystems and their components. Identification of measures of quality and change strategies are attempted for the components for peaceful and fundamental social change through the development of enlightened social policy.
Plan 431  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, fourth year Planning students; students from other Departments with consent of instructor

Env S 444 Land Evaluation and Resource Management
See Env S course descriptions, page 322.

Plan 449  Y 1.0  
Canadian Urban and Regional Planning: (Part 1)
An overview of the evaluation of Canadian urban and regional planning covering the Canadian Planner's heritage, colonial planning, growth stages of post colonial planning, planning principles with an indepth examination of comprehensive planning and zoning, and the scope of planning education especially in our School.
Prereq: Consent of School

Plan 450  Y 1.0  
Canadian Urban and Regional Planning: (Part 2)
A review of Canadian urban literature focusing on major themes. The literature will be examined through subject areas such as housing, land policy, redevelopment and urban politics.
Prereq: Consent of School

Plan 454  W 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 456  Y 2C 1.0  
Political and Administrative Processes in Urban and Regional Planning
The formulation of urban/regional policy, including planning legislation, in an inter-governmental setting: federal, provincial and municipal; the study of both the process and substance of urban policy-making, planning and implementation in Canada.
Prereq: fourth year Planning students or fourth year Environmental Studies students with consent of instructor

Plan 470  W 2C 0.5  
Concepts and Ideas in Contemporary Urban Planning
An overview of the modern movements and philosophical roots underlying urban planning and civic design. Philosophies and contributions of those who have significantly influenced modern historical thought. Development of planning trends and ideas in North America and abroad emphasizing relevance to contemporary concerns.
Prereq: 3rd or 4th year Planning students, or consent of instructor
Plan 490 Y 2.0

Seniors Honours Essay
Practical experience in the identification of a problem in the planning field. Conduct of individual research into this problem and presentation of the results of this research 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; see Note 14, p. 176.

Women's Studies

Women's Studies started at the University of Waterloo in 1971, when the first course on women was taught. Since that time, there has been consistent development of specific courses on women, as well as the integration of Women's Studies in many of the more general courses offered.

All courses that are offered, both at the undergraduate and graduate level, are regular credit courses, counting like any other course toward the fulfillment of requirements for majors and honours in their respective disciplines. These courses do not deal exclusively with women. A substantial proportion of the course material is an examination of women in the context of the particular subject matter. Courses on women have been offered in the Departments of Anthropology, English, History, Philosophy, Political Science, Psychology, Sociology and Social Development Studies. The Arts Library has a special collection on women which has been constantly expanded and which now comprises more than 10,000 items on women. This makes it probably the largest collection on women in Canada. The Canadian Newsletter of Research on Women was started at this University. It appears three times a year and abstracts recent research on women in Canada and abroad.

The Library, The Newsletter, a relatively large number of courses, and people who are actively concerned with research and teaching on women make Women's Studies an important and well developed topic at the University.

Students who are interested in the Women's Studies courses listed on this page will find complete course descriptions in the appropriate departmental sections of this Calendar.

Engl 108E Women in Literature
Engl 208E Women Writers of the 20th Century
Hist 202X The Individual and the Family in History
Phil 201 Love
Phil 202 Philosophy of Women
Phil 220 Moral Issues
P Sci 272 Political Behaviour 2
P Sci 342 Politics of Quebec
Course Descriptions
Women's Studies

P Sci 344 The Politics of Local Government
P Sci 475 Political Socialization
P Sci 476 Research Seminar in Political Behaviour
R S 210 Women and the Great Religions
Soc 200 Marriage and the Family
Soc 206 Sex Roles
Soc 222 Juvenile Delinquency
Soc 223 Deviance: Perspectives and Processes
Soc 236 Social Movements
Soc 243 Occupational Sociology
Soc 248 Health, Illness and Society
Soc 253 Population in Canadian Society
Soc 343 Sociology of Health Care
Soc 354 World Population Problems
Governing Bodies and Staff
The Board of Governors

Officers
Chairman, J. P. R. Wadsworth
Vice-Chairman, E. I. Macintosh
Secretary, J. W. Brown

Ex Officio
Chancellor, J. Kates
President, B. C. Matthews
Mayor of the City of Waterloo, M. Carroll
Mayor of the City of Kitchener, M. A. Rosenberg
Regional Chairman, J. E. Gray

From the Community-at-Large
D. P. Allison, Kitchener
J. Bergsma, St. Catharines
M. Brechin, Etobicoke
G. D. Chapman, Kitchener
J. M. Douglas, Cambridge
H. J. Lang, Toronto
E. I. Macintosh, Kitchener
D. W. Maguire, Agincourt
J. P. R. Wadsworth, Toronto

vacancy

Appointed by the Lieutenant-Governor-in-Council
B. R. E. Foster, Kitchener
D. G. MacLeod, Cambridge
M. Munnoch, Woodstock
D. L. Munson, Waterloo
G. Pattinson, Brantford
R. N. Washburn, Toronto
C. M. Weylie, Kitchener

Staff
D. Kerr
J. A. Swainston

From Senate
Faculty Members
E. M. Avedon
R. A. Aziz
J. H. Bater
P. C. Brillinger
I. L. Campbell
K. D. Srivastava
J. A. Thomson

Undergraduate Students
N. B. Freeman
E. S. Higgs
J. Kama

Graduate Students
A. O. Kostiw
J. A. MacDonald

Senate

Officers
Chairman, B. C. Matthews
Vice-Chairman, T. A. Brzustowski
Secretary, J. W. Brown

Ex Officio
Chancellor, J. Kates, BA, MA, PhD
Chairman, Board of Governors, J. P. R. Wadsworth
President, B. C. Matthews, BSA, AM, PhD, DU
Vice-President, Academic, T. A. Brzustowski, BASc, AM, PhD
Vice-President, Finance & Operations, A. B. Gelliaty, BA, CGA
Librarian, M. C. Shepherd, BEd, MA
Registrar, C. T. Boyes, BA
President, Federation of Students, N. B. Freeman

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 and the Dean of Graduate Studies
R. K. Banks, BA, MA, PhD (Arts)
W. A. McLaughlin, BEng, MS, PhD (Engineering)
J. G. Nelson, BA, MA, PhD (Environmental Studies)
G. S. Kenyon, BPE, MS, PhD (Human Kinetics and Leisure Studies)
J. A. George, MSc, PhD (Mathematics)
R. N. Farvolden, MSc, PhD (Science)
L. A. K. Watt, BSc, MS, PhD (Graduate Studies)

Elected Members

Faculty Representatives
To 1981
R. H. Holmes, BA, MA, PhD (Arts)
J. D. Aplevich, BE, PhD (Engineering)
C. R. Bryant, BA, PhD (Environmental Studies)
J. A. Best, BA, PhD (Human Kinetics and Leisure Studies)
P. C. Brillinger, BA, MA (Mathematics)
H. K. Eilent, BSc, MA (Science)
S. H. Fogel, BA, MA, PhD (St. Jerome's College)
M. D. Bryant, BA, STB, MA, PhD (Renison College)
G. F. Atkinson, MA, PhD (At large)
R. R. Krueger, BA, MA, PhD (At large)
I. J. McGee, BASc, MSc, PhD (At large)
D. S. Scott, BSc, MSc, PhD (At large)
D. M. R. Taplin, BSc, DPhil (At large)
To 1982
D. C. MacKenzie, BA, MA, PhD (Arts)
G. M. McNeice, BASc, MSc, PhD (Engineering)
G. G. Mulamoottil, BSc, MSc, PhD (Environmental Studies)
J. A. Thomson, BA, MSc, PhD (Human Kinetics and Leisure Studies)
P. J. Ponzo, MA, PhD (Mathematics)
A. G. Kempton, MSA, PhD (Science)
P. M. Hinchcliffe, BA, MA, PhD (St. Jerome's College)
R. D. Legge, BA, STB, PhD (St. Paul's College)
D. E. Brodie, BSc, MSc, PhD (At large)
M. P. Bryden, BS, MSc, PhD (At large)
J. W. Dyck, AB, MA, PhD (At large)
vacancy (At large)
vacancy (At large)

To 1983
G. A. Griffin, BA, MA, PhD (Arts)
P. H. Roe, BASc, MSc, PhD (Engineering)
vacancy, (Environmental Studies)
E. M. Avedon, BBS, MA, EdD (Human Kinetics and Leisure Studies)
H. F. Davis, PhD (Mathematics)
R. A. Aziz, BA, MA, PhD (Science)
K. M. McLaughlin, BA, MA, PhD (St. Jerome's College)
W. Klaasen, BA, BD, PhD (Conrad Grebel College)
D. A. Davies, BA, PhD (At large)
F. R. McCourt, BSc, PhD (At large)
G. E. Slethenaug, BA, MA, PhD (At large)
K. D. Srivastava, BSc, BE, PhD (At large)
R. G. Woolford, BSc, MSc, PhD (At large)

Student Representatives
to 1981
Undergraduate
S. W. G. Yip (Engineering)
T. Diamond (Human Kinetics and Leisure Studies)
G. Zimmerman (Mathematics)
J. Kama (At large)

Graduate
M. Bartlett
J. A. MacDonald

To 1982
Undergraduate
vacancy (Arts)
vacancy (Environmental Studies/Integrated Studies)
vacancy (Science)

Graduate
A. O. Kostiwi
V. Narasimhan
Administrative Offices

President
J. G. Hagey, BA, LLD, President Emeritus
B. C. Matthews, BSA, AM, PhD, DU, President and Vice-Chancellor
D. T. Wright, BASc, MS, PhD, President and Vice-Chancellor as of July 1, 1981

University Secretariat
J. W. Brown, BA
University Secretary
P. J. Musclow, BA
Associate University Secretary
E. M. Barnes
Assistant University Secretary

Information Services
J. D. Adams, BA
Director

Fund Raising
J. S. Dellandrea, BA, MEd
Director
J. L. Riegling, BA
Alumni Officer

Office of Operations Analysis
B. R. Foord, CA
Director

Dean of Women
H. Marsden, BA, MA
Dean of Women
I. Mackay, BSc, MSc
Assistant Dean of Women

University Archives
P. G. Cornell, ED, MA, PhD
Honorary Archivist

Vice-President, Academic
T. A. Brzustowski, BASc, AM, PhD, PEng
Vice-President, Academic

Faculty of Arts
R. K. Banks, BA, MA, PhD
Dean of Arts
G. A. Griffin, BA, MA, PhD
Associate Dean (Undergraduate Affairs)
L. L. Haworth, BA, MA, PhD
Associate Dean (Graduate Affairs)
K. L. Ledbetter, BA, MA, PhD
Associate Dean (Special Programmes)
J. F. Wilkins, BA
Secretary and Administrative Officer

Faculty of Engineering
W. A. McLaughlin, BEng, MS, PhD, PEng
Dean of Engineering
P. H. Roe, BASc, MSc, PhD
Associate Dean (Undergraduate Studies)
D. S. Scott, BSc, MSc, PhD
Associate Dean (Graduate Studies)
J. D. Weller, FCA, BA
Executive Assistant to the Dean

Faculty of Environmental Studies
J. G. Nelson, BA, MA, PhD
Dean of Environmental Studies
J. Gardner, BSc, MSc, PhD
Associate Dean (Undergraduate Affairs)
G. G. Mulamoottil, BSc, MSc, PhD
Associate Dean (Graduate Affairs)
D. F. Walker, BSc, MA, PhD
Associate Dean (Special Programmes)
P. C. Brother, BA, MDiv
Executive Assistant to the Dean
N. Smale, BA, MASc
Environmental Studies Counsellor

Faculty of Human Kinetics and Leisure Studies
G. S. Kenyon, BPE, MS, PhD
Dean of Human Kinetics and Leisure Studies
R. S. McColl, BSc, PhD
Associate Dean (Undergraduate Affairs)
B. D. McPherson, BA, MA, PhD
Associate Dean (Graduate Affairs)
F. E. Chambers, BA
Administrative Assistant to the Dean
C. A. Totzke, BA
Director of Athletics

Faculty of Mathematics
J. A. George, MSc, PhD
Dean of Mathematics
I. J. McGee, BASc, MSc, PhD
Associate Dean (Undergraduate Studies)
K. D. Fryer, BA, MA, PhD
Associate Dean (Undergraduate Studies)
R. B. Simpson, MASC, PhD
Associate Dean (Graduate Studies)
P. C. Brillinger, BA, MA
Director of Graduate Affairs
R. J. Bullen, BMath
Associate Director of Undergraduate Affairs
K. D. Hunt
Executive Assistant to the Dean
Faculty of Science
R. N. Farvolden, MSc, PhD
Dean of Science
D. A. Brisbin, BSc, PhD
Associate Dean (Undergraduate Affairs)
R. A. Aziz, BA, MA, PhD
Associate Dean (Graduate Affairs)
J. L. Daniel
Administrative Assistant to the Dean

Canadian Studies
R. R. Krueger, BA, MA, PhD
Chairman, Canadian Studies Programme Board
S. E. McMullin, BA, MA, PhD
Director, Canadian Studies

Integrated Studies
M. L. Breidenbaugh, BA, PhD
Chairman, Academic Board
T. W. Smyth, MA, BTA
Operations Council Co-ordinator

University Graduate Office
L. A. K. Watt, BSc, MS, PhD
Dean of Graduate Studies
H. Bensusan
Associate Registrar (Graduate Studies)

Office of Research Administration
E. L. Holmes, BSc, MASc, PhD
Director

Teaching Resource Office
C. K. Knapper, BA, PhD
Teaching Resource Person

Academic Services
D. P. Robertson, BComm
Director of Academic Services

Audio Visual Centre
G. Downie
Director

Centre for the Arts
D. S. Donaldson, BMus
Manager

Computing Services
P. H. Dirksen, BSc, MA
Director
J. W. Dodd, BASc, MSc
Associate Director, Operations
G. S. Hill
Assistant Director, Administration
P. J. Sprung, BA, MA
Associate Director, Information Systems and Planning
R. W. Watt, BSc, MMath
Associate Director, User Services
W. R. White, BMath, MMath
Associate Director, Systems

Co-ordination and Placement
R. J. Wieser, BEng, PEng
Director

Associate Directors
B. A. McCallum, BA
J. C. Wilson, BSc, CE, PEng

Counselling Services
J. L. Williams, BA, MA, PhD
Director

Counsellors
W. W. Dick, BA, BD, MA, PhD
A. L. Evans, BA, BD, STM, DMin
L. Kellar, BA, MASc
R. L. Knight, BA
S. Mines, BA, MA
R. J. Walsh, BA, MASc
J. J. Wine, BA, MA, PhD

Data Processing
J. D. Walker, BA, MASc
Director

Project Managers
R. M. Dougan, CGA
R. R. Kempel
W. C. Montgomery, BA
Health Services
D. E. Andrew, BA, MD, FRCP(C)  
Medical Director
L. Davenport, RN  
Supervisor
C. Sundberg, RN, PN, BA, MASc  
Counsellor

Library
M. C. Shepherd, BEd, MA(LS)  
University Librarian
B. MacNeil, BSc, MLS  
Associate Librarian, Reader Service
C. D. Emery, BA, ALA  
Associate Librarian, Support Services
C. Presser, AB, MLS  
Assistant Librarian, E.M.S. Divisional Library
S. Bellingham, BA, MLS  
Rare Books Librarian
L. Beattie, BA, MA, PhD  
Assistant to the Librarian - Administration
G. Damon, BA, MSLS  
Assistant Librarian for Systems

Office of the Registrar
C. T. Boyes, BA  
Registrar
B. A. Lumsden, BA  
Associate Registrar, Admissions
J. T. Boniface, BSc  
Associate Registrar, Records
G. L. Buckley  
Assistant to the Registrar
G. V. Ambrose  
Assistant Registrar - Arts, Science
P. F. Burroughs, BA, MSc  
Assistant Registrar - Environmental Studies, Human Kinetics & Leisure Studies, Integrated Studies
B. K. Mueller, BMath  
Assistant Registrar - Mathematics
N. S. Walker, BA  
Assistant Registrar - Engineering
S. J. Little, BA  
Liaison and Publications Officer
D. L. Kasta, BA, MA  
Student Awards Officer and Co-ordinator of Part-time Studies
P. J. Critchley  
Co-ordinator of Scheduling

Vice-President, Finance and Operations
A. B. Gellatly, BA, CGA  
Vice-President, Finance and Operations
B. R. Foord, CA  
Internal Auditor
S. S. Farrell, BA, MBA  
Operating Budgets Analyst

Financial Services
A. H. Headlam, FCA, MBA  
Comptroller
J. M. Robb, CGA  
Director of Accounting
V. E. Leavoy  
Research Grants and Trust Funds Manager
J. S. Phillips, MCI  
Student Accounts
D. J. Battae  
Payroll Manager
B. Scott, BMath, MASc  
Staff Accountant and Registration Accounting

Administrative Service Group
W. G. Deeks  
Director
E. Dodds  
Director, Book Store
R. W. Mudie  
Director, Food Services
M. J. Rowe  
Director, Graphic Services
C. A. Lawrence  
Director, Telecommunications and Distribution
E. P. Whelan, BA, PMAC  
Director of Purchasing

Personnel
E. S. Lucy, BA  
Director
R. J. Elliott, BA  
Associate Director - Staff Relations and Salary Administration
L. W. Brown  
Assistant Director - Labour Relations
A. H. Boyd  
Assistant Director - Pensions and Benefits

Physical Planning
A. E. Lappin, PEng  
Director
N. Ozark, CRSP  
Director, Safety

Plant Operations
J. W. G. Sloan, PEng  
Director

Housing and Residences Operation
H. R. N. Eydt, MSc, PhD  
Warden of Residences
A. F. Woodcock, BSc  
Director, Housing and Residence Operations

Security
A. E. Romenco, BSc  
Director
Index 1 - Faculty Members

Arts, Faculty of
- Anthropology (Dept. of), 250
- Canadian Studies, 269
- Classical Studies (Dept. of), 290
- Drama and Theatre Arts Group, 296
- Economics (Dept. of), 303
- English (Dept. of), 315
- Fine Arts (Dept. of), 325
- French (Dept. of), 330
- Germanic and Slavic Languages and Literature (Dept. of), 343
- History (Dept. of), 353
- Italian, 360
- Legal Studies, 366
- Music, 409
- Peace and Conflict Studies, 416
- Philosophy (Dept. of), 419
- Political Science (Dept. of), 434
- Psychology (Dept. of), 440
- Religious Studies (Dept. of), 451
- Social Development Studies, 461
- Sociology (Dept. of), 466
- Spanish (Dept. of), 472
- Studies in Personality and Religion, 475
- Women's Studies, 488

Engineering, Faculty of
- Chemical Engineering (Dept. of), 272
- Civil Engineering (Dept. of), 285
- Electrical Engineering (Dept. of), 310
- Management Sciences (Dept. of), 371
- Mechanical Engineering (Dept. of), 403
- Systems Design Engineering (Dept. of), 476

Environmental Studies, Faculty of
- Architecture (School of), 253
- Geography (Dept. of), 336
- Man-Environment Studies (Dept. of), 367
- Urban and Regional Planning (School of), 482

Human Kinetics and Leisure Studies, Faculty of
- Dance Group, 294
- Health Studies (Dept. of), 351
- Kinesiology (Dept. of), 361
- Recreation (Dept. of), 447

Mathematics, Faculty of
- Applied Mathematics (Dept. of), 374
- Combinatorics and Optimization (Dept. of), 374
- Computer Science (Dept. of), 375
- Pure Mathematics (Dept. of), 376
- Statistics (Dept. of), 376
- Strategy Board Members, 377

Science, Faculty of
- Biology (Dept. of), 283
- Chemistry (Dept. of), 277
- Earth Sciences (Dept. of), 299
- Optometry (School of), 411
- Physics (Dept. of), 427
Index 2 - General

A

Abbreviations, Subject, 249
Academic Calendar, 5, 6, 7, 8
Academic Organization, 15
Academic Offenses, 19
Academic Services, 493
Actuarial Science, 198, 378
Administrative Offices, 494
Admissions, 27
  Adult Students, 27
  Advanced Standing, 27
  Application Dates, 32
  Application Procedures, 32
  English Proficiency Test, 31
  Equivalent Certificates, 31
  General Requirements, 27
  Limited Enrolment, 26
  Non-Grade 13, 27
  Ontario Grade 13, 27
  Permanent Resident Status, 31
Specific Requirements and Recommendations, 28-30
Transfer Credit, 27
Anthropology, 87, 250
Applied Mathematics, 198, 379
Applied Studies Co-op, 88
Archaeology, see Anthropology, 87, 250
Architecture, 157, 253
Arts (Fine Arts), 97, 325
Arts, (Elective Course Descriptions), 261
Arts, Faculty of, 80
  Admission, 80
  Course Descriptions, 261
  Degree Requirements, 83
  Dropping/Adding Courses, 82
  Examinations and Standings, 84
  General Programmes, 80
  Honours Programmes, 81
  Interdisciplinary Options, 82
  Minor Programmes, 81
Athletics Dept., 20
Averages, interpretation of, 18
Awards and Financial Assistance, 44

B

Biology, 221, 263
Board of Governors, 492
Book Store, 20
Bursaries, 52
Business Administration Option, 204

C

Campus Map, 10, 11
Canadian Studies, 124, 289
Career Information Centre, 21
Centre for Information Theory, 131, 208
Centre for the Arts, 21
Chartered Accountancy Option, 93, 204
Chemical Engineering, 132, 272
Chemistry, 226, 277
Child Care Option, 113
Church Colleges, 15
Civil Engineering, 135, 285
Classical Civilization, 89, 290
Classical Studies, 89, 290
Codes, Subject, 249
Combinatorics and Optimization, 199, 382
Computer Science, 200, 385
Computing Services, 21
Conrad Grebel College, 15
  Residence, 15
Co-operative System of Study, 16, 60
Co-operative Plan, 60
Co-operative Students, Employers of, 66
Co-ordination and Placement (Dept. of), 60
Correspondence Courses, 17
Counselling Services, 21
Course changes see Dropping/Adding Courses
Cross Registration (with Wilfrid Laurier University), 17

D

Dance, 178, 181, 294
Dean of Women, (Office of), 21
Degrees Offered, 16
  (See also Faculty sections)
Directions to UW Campus, 12
Drama and Theatre Arts, 91, 296
Dropping/Adding Courses
  Arts, 82
  Engineering, 128
  Environmental Studies, 154
  Human Kinetics & Leisure Studies, 180
  Mathematics, 212
  Science, 220
Dutch, 347

E

Early Childhood Education, 113
Earth Science, 232, 299
Economics, 92, 303
Electrical Engineering, 137, 310
Employers of Co-op Students, 66
Engineering, Faculty of, 126
  Academic Programmes, 131
  Admission, 125
  Centre for Information Theory, 131
  Chemical Engineering, 132, 272
  Civil Engineering, 135, 285
  Combined Bachelor's-Master's Programme, 129
  Degrees, 126
  Dropping/Adding Courses, 128
  Electrical Engineering, 137, 310
  Examinations and Promotions, 127
  General Engineering, 335
  Management Sciences, 139, 371
  Mechanical Engineering, 141, 403
  Systems Design Engineering, 144, 476
  Work Term Reports, 129

English, 95, 315
English Language Proficiency Programme, 83
  Arts, 83
  Environmental Studies, 151
  Human Kinetics & Leisure Studies, 179
  Mathematics, 214

Enrolment, 15
Environmental Studies, Faculty of, 160, 322
  Academic Programmes, 154
  Admission, 151
  Architecture, 157, 253
  Degrees, 150
  Dropping/Adding Courses, 154
  Examinations and Standings, 151
  Geography, 160, 336
  Man-Environment Studies, 169, 367
  Urban and Regional Planning, 171, 482
Equivalent Certificates, 31
Examination Regulations, 18
Examinations and Standings
  (See Faculty Sections)

F

Federation of Students, 20, 41
Fees, 36
  Assessment, 36
  Dropping/Adding Courses, 38
  Payment, 36
  Schedule, 39
  Withdrawals, 38
Film Studies Option, 98
Finance and Operations, 496
Financial Aid, 44
Fine Arts, 97, 325
Foreign Students, 40, 41
French, 98, 330

G

General Engineering, 335
Geography, 99, 160, 336
Geology, 234, 299
German, 102, 343
Glossary of Terms, 4
Governing Bodies and Staff, 492
  Administrative Offices, 494
  Board of Governors, 492
  Senate, 492
Government Assistance Programmes, 58
Grading System, 16
  (See also Faculty sections)
Greek, 89, 291

H

Health Insurance, Student, 41
Health Services, 22
Health Studies, 176, 183, 351
History, 104, 353
Honorary Degrees, 16
Human Kinetics and Leisure Studies, Faculty of, 178
  Academic Programmes, 181
  Admission, 179
  Degrees, 178
  Dance, 178, 181, 294
  Dropping/Adding Courses, 180
  Examinations and Standings, 179
  Health Studies, 178, 183, 351
  Kinesology, 178, 184, 361
  Recreation, 178, 186, 447
  Systems of Study, 179

I

Imprint, 20, 41
Integrated Studies, 190
Interdisciplinary Social Science, 462
International Student Office, 23
Inventors' Assistance, 22
Italian, 104, 360

K

Kinesiology, 178, 184, 361

L

Landed Immigrant Status see Permanent Resident Status, 31, 40
Latin, 90, 292
Laval, (Waterloo at), 330
Legal Studies, 105, 366
Leisure Studies, (Faculty of Human Kinetics and), 178
Libraries, 76
Limited Enrolment, 26
Loan Funds, 57
Location of Kitchener/Waterloo, 12
<table>
<thead>
<tr>
<th>M</th>
</tr>
</thead>
<tbody>
<tr>
<td>Man-Environment Studies, 169, 367</td>
</tr>
<tr>
<td>Management Accounting Option, 94, 204</td>
</tr>
<tr>
<td>Management Sciences, 139, 371</td>
</tr>
<tr>
<td>Management Studies, 372</td>
</tr>
<tr>
<td>Mannheim Programme, 103</td>
</tr>
<tr>
<td>Mathematics, Faculty of, 194, 373</td>
</tr>
<tr>
<td>Academic Programmes, 194</td>
</tr>
<tr>
<td>Actuarial Science, 198, 378</td>
</tr>
<tr>
<td>Admission, 194</td>
</tr>
<tr>
<td>Applied Mathematics, 198, 379</td>
</tr>
<tr>
<td>Combinatorics &amp; Optimization, 199, 382</td>
</tr>
<tr>
<td>Computer Science, 200, 385</td>
</tr>
<tr>
<td>Degrees, 195</td>
</tr>
<tr>
<td>Dropping/Adding Courses, 212</td>
</tr>
<tr>
<td>Mathematics, 390</td>
</tr>
<tr>
<td>Mathematics Electives, 397</td>
</tr>
<tr>
<td>Operations Research, 201</td>
</tr>
<tr>
<td>Pure Mathematics, 201, 398</td>
</tr>
<tr>
<td>Standings and Promotions, 209</td>
</tr>
<tr>
<td>Statistics, 202, 400</td>
</tr>
<tr>
<td>Mechanical Engineering, 141, 403</td>
</tr>
<tr>
<td>Medieval Studies, 105</td>
</tr>
<tr>
<td>Music, 106, 409</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notre Dame</td>
</tr>
<tr>
<td>Residence, 15</td>
</tr>
<tr>
<td>Nurses, Programmes for,</td>
</tr>
<tr>
<td>BScN, 17</td>
</tr>
<tr>
<td>Occupational Health, 17</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>O</th>
</tr>
</thead>
<tbody>
<tr>
<td>OSAP, 58</td>
</tr>
<tr>
<td>Office of Research Administration, 22</td>
</tr>
<tr>
<td>Ontario Industrial Innovation Centre, 22</td>
</tr>
<tr>
<td>Operations Research, 201</td>
</tr>
<tr>
<td>Optometry, 239, 411</td>
</tr>
<tr>
<td>Organizations Employing Co-op Students, 66</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part-time Studies, 16</td>
</tr>
<tr>
<td>Peace and Conflict Studies, 106, 416</td>
</tr>
<tr>
<td>Permanent Resident Status, 31, 40, 41</td>
</tr>
<tr>
<td>Personnel &amp; Administrative Studies, 418</td>
</tr>
<tr>
<td>Philosophy, 107, 419</td>
</tr>
<tr>
<td>Physically Disabled, Facilities For, 23</td>
</tr>
<tr>
<td>Physics, 235, 427</td>
</tr>
<tr>
<td>Planning, Urban and Regional, 171, 482</td>
</tr>
<tr>
<td>Polish, 350</td>
</tr>
<tr>
<td>Political Science, 108, 434</td>
</tr>
<tr>
<td>Pre-Registration, 36</td>
</tr>
<tr>
<td>Psychology, 112, 440, 462</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radio Waterloo, 40, 41</td>
</tr>
<tr>
<td>Recreation, 178, 186, 447</td>
</tr>
<tr>
<td>Registrar (Office of), 22</td>
</tr>
<tr>
<td>Registration, 36</td>
</tr>
<tr>
<td>Regular System of Study, 16</td>
</tr>
<tr>
<td>Religious Studies, 113, 451</td>
</tr>
<tr>
<td>Renison College, 15</td>
</tr>
<tr>
<td>Admission, 26</td>
</tr>
<tr>
<td>Awards, 51</td>
</tr>
<tr>
<td>Residence, 15</td>
</tr>
<tr>
<td>Research Administration (Office of), 22</td>
</tr>
<tr>
<td>Residences, 23, 42</td>
</tr>
<tr>
<td>Russian, 115, 347</td>
</tr>
<tr>
<td>Russian Workshop (Dyuny), 347</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sanford Fleming Foundation, 41</td>
</tr>
<tr>
<td>St. Jerome's College, 15</td>
</tr>
<tr>
<td>Admission, 26</td>
</tr>
<tr>
<td>Awards, 50</td>
</tr>
<tr>
<td>Residence, 15</td>
</tr>
<tr>
<td>St. Paul's College, 15</td>
</tr>
<tr>
<td>Residence, 15</td>
</tr>
<tr>
<td>Scholarships, 44</td>
</tr>
<tr>
<td>Science, (Elective Course Descriptions), 457</td>
</tr>
<tr>
<td>Science, Faculty of, 216</td>
</tr>
<tr>
<td>Academic Programmes, 219</td>
</tr>
<tr>
<td>Admission, 216</td>
</tr>
<tr>
<td>Biology, 221, 263</td>
</tr>
<tr>
<td>Chemistry, 226, 277</td>
</tr>
<tr>
<td>Degrees, 216</td>
</tr>
<tr>
<td>Dropping/Adding Courses, 220</td>
</tr>
<tr>
<td>Earth Sciences, 232, 299</td>
</tr>
<tr>
<td>Examinations and Standings, 217</td>
</tr>
<tr>
<td>General Science, 243</td>
</tr>
<tr>
<td>Honours Science, 241</td>
</tr>
<tr>
<td>Optometry, 239, 411</td>
</tr>
<tr>
<td>Physics, 235, 427</td>
</tr>
<tr>
<td>Psychology, 238, 440</td>
</tr>
<tr>
<td>Senate, 492</td>
</tr>
<tr>
<td>Slavic Studies, 115</td>
</tr>
<tr>
<td>Social Development Studies, 116, 461</td>
</tr>
<tr>
<td>Social Work, 117, 464</td>
</tr>
<tr>
<td>Society Fees, 41</td>
</tr>
<tr>
<td>Sociology, 118, 463, 466</td>
</tr>
<tr>
<td>Spanish, 119, 472</td>
</tr>
<tr>
<td>Statistics, 202, 400</td>
</tr>
<tr>
<td>Strategy Board Members, 377</td>
</tr>
<tr>
<td>Student Authorizations, 40, 41</td>
</tr>
<tr>
<td>Student Awards, 44</td>
</tr>
<tr>
<td>Students' Council, 20</td>
</tr>
<tr>
<td>Student Services, 20</td>
</tr>
<tr>
<td>Studies in Personality and Religion, 121, 475</td>
</tr>
<tr>
<td>Subject Codes, 449</td>
</tr>
</tbody>
</table>
Index
General

T

Teacher Certification in Ontario, 83, 221
Teaching Option (Mathematics), 207
Teaching Resource Office, 23
Theatre Arts, 91, 296
TOEFL (Test of English as a Foreign Language), 31
Tuition, 39

U

Ukrainian, 350
University, 14
  Colours and Coat of Arms, 14
  Jursidiction, 14
  Mace, 14
Urban and Regional Planning, 171, 482

V

Visitors Reception Centre, 24

W

Waterloo Advisory Council, 65
Waterloo at Laval, 330
Waterloo in Germany, 103
Wilfrid Laurier University (Cross Registration), 17
Withdrawals, 38
Women, Dean of, 21
Women's Studies, 488
Work Reports, 64
Work Term Report Awards, 49
Work Terms, 62
WPIRG, 41